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Gender gaps in the unemployment rate in the principal European countries from a macro and micro aspect

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Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgment, the work presented is entirely my own.

Jiexin Xie

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Date Signature

Acknowledgements

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Abstract

There is a growing public interest in the differences in labour market behaviour and the treatment of women and men. Although women's participation in the labour market is on the increase, gender segregation and wage differentials remain substantial. The aim of this thesis is to chart the evolution of gender differences in the unemployment rates of European countries over the past one or two decades, particularly during recession periods, which are defined by the temporary slowdown of economic activity, as well as drops in GDP and employment rates. Indeed, the ultimate aim is to establish the determinants of unemployment rate differences by gender. With reference to the datasets and available data, Chapter 3 and Chapter 4 will focus on different aspects of the unemployment gender gap. Chapter 3 will use aggregate macro data to obtain an introductory idea of the determinants of the main variables in the aggregate evolution of unemployment rate difference by gender. Generally speaking, I have found that the closing of the unemployment gender gap in Mediterranean countries was due to the convergence in the labour market attachment of men and women, and largely due to the improvement of female labour market attachment. Moreover, economic status plays a more important role, especially during recession periods. In light of this, Chapter 4 uses micro data to analyse labour market transition rates by gender, in order to determine the underlying reason for aggregate unemployment gender gap changes. The results tend to vary across countries. In Spain, the UK, and Belgium, there is obviously a clear difference before the crisis

and during the crisis. This may well be due to the high proportion of male workers in the industrial sector, which was hit the hardest by the recession. However, in Germany, Austria, and the Netherlands, the differences between male and female labour market transition are relatively stable over the whole data period. Indeed, this conclusion is based on recent research which highlighted the importance of three occurrences: firstly, the three countries have experienced a transitory external demand shock; secondly, they are expected to face long-term shortages of skilled workers; lastly, they all applied short-time work during the recession periods.

Lay Summary

The unemployment gender gap is defined as the difference between female and male unemployment rates. The aim of this thesis is to establish exactly what causes this difference, and what has caused the difference to change over time in several European countries. I argue that the narrowing of the unemployment gender gap in Spain, Portugal and Italy was driven by the fall in female unemployment rates that arose from an increase in female education attainment. Moreover, countries' economic situation plays an important role in influencing the unemployment gender gap during the economic recession. Compared to Spain, the UK, and Belgium, the unemployment rate and labour market transition rate by gender, have been fairly stable during the crisis in Germany, Austria, and the Netherlands, leading to the relatively mild decrease in employment during the economic recession.

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1 Introduction

1.1 Background

As stated above, the unemployment gender gap is defined as the difference between female and male unemployment rates (the female unemployment rate minus the male unemployment rate). Prior to 2000, in some European countries, female unemployment rates had been considerably higher than for men for many years (gender gaps of unemployment rate were positive), most notably in Spain, Italy, Greece and France. In other countries, such as the UK, Finland and Norway, gender unemployment gaps are close to zero or even negative.

As shown in Figure 1 through to Figure 13 at the end of this Introduction chapter, while these principal EU countries used to have higher and positive unemployment rate gaps, the differences have virtually disappeared over the last 10 to 20 years, which is also what happened in the US during the period spanning 1968-85. DeBoer and Seeborg (1989) examined this change by performing a labour force transition probability analysis, where transition referred to the movement between the following three states: Employment (E), Unemployment (U) and Non-participation (N). They showed that the narrowing of the unemployment rate differential was largely due to the increasing labour force attachment of women and the decreasing attachment of men.

The increasing female labour force attachment means that women become more likely to join and stay in the labour force, and less likely to leave the labour force; in contrast, decreasing male labour force attachment means that men are more likely to leave the labour force. Abraham and Shimer (2001) stated that labour force attachment could affect unemployment and unemployment duration in at least two ways. On the one hand, workers who have a stronger attachment to the labour force tend to stay unemployed when they lose a job, rather than dropping out of the labour force completely. This raises both the unemployment rate and unemployment duration. On the other hand, as they are less likely to quit their jobs and leave the labour force, they can build up stable employment relations with a minimal incidence of unemployment. This reduces the unemployment rate and may also raise unemployment duration by reducing the pool of workers who chronically transition out of the labour force from unemployment. The existing empirical evidence seems to show that the second effect on unemployment rate has outweighed the first. For example, studies by Seeborg and DeBoer (1989), and Albanesi and Sahin (2013) showed that the decrease of the US unemployment gender gap, which began in 1970, was due to the convergence in labour market attachment of men and women. More specifically, in countries with positive unemployment gender gaps, increasing female labour force attachment leads to lower female unemployment rate. As such, the convergence of female and male labour force attachment results in lower unemployment gender gaps. Similarly, Azmat, Güell and Manning (2006)

investigated the differentiation in the gender gap of the unemployment rate for many OECD countries during the late 1990s. They indicated that unemployment gender gaps are found to be smaller in countries associated with better female labour market attachment. In addition, unemployment gender gaps gradually decrease with the improvement of female labour force attachment. It is notable that these empirical studies often use human capital, such as education level, as proxy of labour force attachment (Azmat, Güell and Manning, 2006). According to the human capital theory, as people invest more in human capital, e.g. obtaining a higher level of education, they are more likely to participate in the labour force for the returns of human capital. Appendix Figure A1.1 to Figure A13.2 shows the education structure changes of many European countries, while a detailed discussion of these changes will be provided in Chapter 3.

The great recession has led to the sharpest contraction in the history of the European Union since 2008. As shown in Table 1, most countries' economies started to weaken considerably in 2008. Moreover, it seems that this weakening has affected the European Union Member States to varying degrees. With regard to GDP growth rates, countries such as Finland, Germany, Ireland, Italy, Luxembourg, and Sweden have been more affected by the recession. Meanwhile, the recession has led to a significant increase in unemployment rates for both genders across Europe. More importantly, and as seen in the grey areas from Figure 1 through to Figure 13, at the beginning of the recession, male unemployment rates grew faster than female rates in most of the

European countries. Indeed, this 'helps' those countries with positive gender unemployment gaps to have declining gaps, and helps the countries with negative gender unemployment gaps to have more negative gaps.

The US labour market has experienced every recession in the exact same way as these European countries since 1980. Sahin, Song and Hobijn (2010) pointed out that the recent recession has had a more adverse effect on men than women. The reason for this is that men are highly concentrated in sectors such as goods producing and the industrial sector – the sectors which suffered most during the recession. The scale of the decline of employment in these sectors seems to be permanent and it is likely to see significant structural change, as it did after the 2001 recession. As a result, the declines of employment will not be reversed, and reallocating the excess labour supply will take time. Albanesi and Sahin (2013) also indicated that the gender unemployment gap in the US disappeared after 1980, except for the periods of recession, when male unemployment rates always exceeded those for women. In a similar vein, Sahin, Song and Hobijn (2010) found that gender differences in industry composition are important in recessions, and particularly the most recent recession.

This evidence of industry composition also seems to be present in Europe. The gender differences in industry composition are reported in Table 2, which shows eight EU countries' male and female employment by sector activities, in 2007, 2009, and 2011 respectively. First, it is a common fact across these countries that males are highly

concentrated in the agriculture and industrial sector, particularly in manufacturing and construction sectors. Meanwhile, the gender differences of employment in service sectors appear to be much less. Females seem to dominate in education and health sectors, but not in other sectors. Second, data for the period spanning 2009-2011 show much larger drops in industrial sector employment than service sector employment, which explains why male unemployment rates grow faster than female rates during this recession period. More precisely, countries like Spain, the UK, the Netherlands, Germany, and Italy have experienced huge employment declines in the manufacturing sector. Spain has experienced the most dramatic change in terms of construction employment, which is consistent with the housing bubble burst. The UK and Italy also appear to have larger drops in construction employment than other countries.

At this point, the European Union, along with each member country, have enacted fiscal and monetary stimulus plans in response to the economic downtown. For instance, the European Union passed a 200 billion euro plan which involves member countries developing their own national plans. Moreover, the European Central bank (ECB) has cut its interest rate on its main refinancing operation by 50 basis points. For most member countries, different combinations of government spending and tax cuts are used to boost economies. All of these immediate recession-response policies mostly focussed on avoiding job loss as well as stabilising and simulating aggregate demand. In some EU countries, the adoption of temporarily shorter working hours has prevented more significant labour shedding, particularly in manufacturing; the leading

example is Germany. Although the short-time compensation schemes are widespread among OECD countries, there are large cross-country differences in take-up rates. Moreover, in the recent recession, Germany made a particularly intensive use of this type of scheme (Cahuc and Carcillo, 2011). The short-time working hours scheme, as well as Germany's own stable labour market and strong economic position before the crisis, have largely cushioned the job losses. Similar countries include Austria and the Netherlands, with more discussion on these countries provided in Chapter 4.

1.2 Motivations and Summary of results

There is a growing public interest in the differences in labour market behaviour and the treatment of women and men. Continuous and rapid change in society has led to changes in gender roles. Although female labour force participation has been increasing, gender segregation and wage differentials remain extensive. Owing to the recent recession, unemployment has recently become a major problem in many European countries and, on the basis of statistical evidence, there appear to be some clear differences between male and female unemployment.

When we look at males and females separately, the gender differences in relation to the unemployment rates are determined by both exogenous and endogenous factors, where the exogenous factors make workers unemployed even if they are looking for jobs, and the endogenous factors mean that workers voluntarily choose not to join the labour force. People's unemployment status can largely determine individuals' wellbeing. On the one hand, the most debatable exogenous factor, and on which has received a lot of attention, is gender discrimination. Indeed, this discrimination causes female workers to involuntarily fail in their attempts to get jobs, even if they have the same characteristics as male workers. On the other hand, women traditionally have more responsibilities within the household. As a result, male and female workers may make different labour market decisions due to this endogenous factor. For example, female workers might choose not to participate in the labour market voluntarily in

order to take care of the family, or choose to keep searching for jobs rather than taking certain jobs offers. In these cases, the voluntary decision to maximise their utility leads to differences between male and female unemployment rates as well. As such, the labour market policy must first establish where the unemployment gender gaps come from and whether the situation has changed over time, in order to set the correct agenda to maximise workers' wellbeing.

By looking at several European countries, this thesis will expand the understanding of unemployment gender gaps, as these countries share similar histories and culture backgrounds. At the same time, there are similarities and differences in regard to the labour market institutions, such as expenditure on the labour market programmes (LMP), employment protection laws, and minimum wages. Table 3 provides a summary of several labour market institutional indicators. In essence, the interaction between these labour market policies leads to labour market outcomes. According to Rovelli and Bruno's (2008) cross-country comparison, higher employment rates are generally associated with higher expenditures on labour market programmes, and a lower degree of rigidity of labour market institutions. In this thesis, by researching the unemployment gender gaps in different European countries under different labour market policies, I can develop a better understanding of the impact of labour market policies and other factors on aggregate unemployment rates.

The aim of this thesis is to chart the evolution of gender differences in the unemployment rates of European countries, in order to pinpoint the determinants of the unemployment rate differences by gender. The research will focus on data from the past one or two decades, particularly during the recent crisis. Similar patterns have materialised, and indeed been studied, in the US, although there is relatively less research in European countries. In this thesis, Chapter 2 contains related studies on unemployment gender gaps. According to the datasets and available data, Chapter 3 and Chapter 4 will focus on different aspects of the unemployment gender gap in line with the following:

Chapter 3 will use aggregate macro data, such as male and female unemployment rates, education variables and GDP indicators to get an introductory idea of the impacts of main variables on the aggregate evolution of unemployment rate difference by gender across 13 countries and over 17 years. This also serves as preparation for the transition analysis which will be conducted in Chapter 4. I have generally found that the closing of the unemployment gender gap in Mediterranean countries was due to the convergence in the labour market attachment of men and women, and largely due to the improvement of female labour market attachment. Moreover, economic status plays a more important role, especially during recession periods.

Following this, Chapter 4 uses a micro data EU-SILC (Community Statistics on Income and Living Conditions) dataset with individual economic activity information

to analyse labour market transition rates by gender. The goal here is to determine the underlying reason for aggregate unemployment gender gap changes. The results tend to vary across countries. In Spain, the UK, and Belgium, there is obviously a significant difference before a crisis and during a crisis. This evidence might be due to the fact that more male workers were losing their jobs in male dominated industries like the manufacturing and construction sectors, which is also supported by the facts shown in Table 2. At the same time, there were no proper policy instruments to cushion the labour market impact of the crisis. However, in Germany, Austria, and the Netherlands, the differences between male and female labour market transition are relatively stable over the whole data period. Based on recent research (Brenke, Rinne and Zimmermann, 2013; Rinne and Zimmermann, 2011; Burda and Hunt, 2011; Cahuc and Carcillo, 2011), three occurrences have resulted in this evidence: firstly, the three countries experienced a transitory external demand shock; secondly, they are expected to face long-term shortages of skilled workers; lastly, they all applied short-time work during the crisis.

In summary, compared to Chapter 3, where the impact of education and economic status on aggregate unemployment gap by gender have been clarified, the transition analysis in Chapter 4 gives a more detailed explanation of the source of the aggregate unemployment rate. More specifically, with regard to education variables, Chapter 3 provides a clear evidence that education variables can largely explain male and female

unemployment rates, as well as the unemployment gender gaps, especially in Mediterranean countries. While Chapter 4 fails to exam the relation between the labour market transition rates and education variables, or other characteristic variables, due to the insufficient number of observations. With regard to the economic status, the results in Chapter 3 and Chapter 4 both highlight the importance of economic status on the unemployment gender gaps especially during the crisis in countries like Spain, UK, and Belgium. Compared to Chapter 3, Chapter 4 is able to track which transition rate plays the more important role, and how the importance of these transition rates change over time. In the end, Chapter 4 provides a more detailed policy discussion and indication in order to protect female and male workers' benefits.

Table 1 GDP growth rate (%), 2007-2010

	2007	2008	2009	2010
Austria	3.62	1.55	-3.80	1.93
Belgium	3.40	0.75	-2.28	2.69
Denmark	0.82	-0.72	-5.09	1.63
Finland	5.18	0.72	-8.27	2.99
France	2.36	0.20	-2.94	1.97
Germany	3.30	1.10	-5.65	4.13
Greece	3.27	-0.34	-4.30	-5.48
Ireland	5.54	-2.16	-5.64	0.40
Italy	1.47	-1.05	-5.48	1.71
Luxembourg	8.40	-0.84	-5.38	5.68
Netherlands	3.70	1.70	-3.77	1.40
Norway	2.93	0.38	-1.62	0.60
Portugal	2.49	0.20	-2.98	1.90
Spain	3.81	1.11	-3.64	0.02
Sweden	3.40	-0.56	-5.18	5.99
UK	2.59	-0.47	-4.19	1.54

Source: World Bank.

Table 2 Male and Female Employment by activities (thousands)

		Austria		Belgium		Finland		Germany		Italy		Netherlands		Spain		The UK	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Agriculture	2007	124	107	55	25.2	82	32	579	279	643	281	172.1	69.5	675.2	250.3	209	90
	2009	123	102	58	21	79	34	589	280	626.6	247.8	154.5	63.6	582.9	205.2	240.2	71.2
	2011	130	99	41	18	76	29	425	212	587.3	244.6	148.1	57.8	557.5	197.8	262	80.4
Industry																	
Mining and quarrying	2007	7.5	1	7.1	2	4	0	97	11	34	5	9.5	0	53.6	6.5	105	27
	2009	8.5	2	5	1	5	0	96	14	28.7	4.5	9.6	0	40.8	3.6	94.4	18.8
	2011	9.2	2	4	0.5	5	1	86	11	33.8	4.4	6.3	0	38.1	3.9	90.1	9.2
Manufacturing	2007	543	187	546	179	323	122	6026	2365	3493	1377	783.2	231.8	2298	791.5	2700	855
	2009	485	173	515	163	280	99	5911	2287	3334	1259	651.1	196.4	1895	654.4	2101	674.3
	2011	515	182	488	154	269	91	5600	2094	3087	1139	587.9	173.5	1759	590.2	2170	697.7
Electricity, gas, water supply	2007	24	6.4	25	9	12	4	255	79	115	25	29.8	11.3	89.5	22.4	274	86
	2009	24	4	32	8	21	6	277	92	117.9	27.5	56.5	17.5	175.8	38	288.9	80.7
	2011	27	9.1	52	12	19	5	453	131	280.7	56.6	52.1	14.1	175.9	37.1	337.5	83.4
Construction	2007	289	40	278.9	24	162	11	2221	304	1852	103	457	43.8	2544	152.6	2273	344
	2008	271	41	286	23	160	14	2232	315	1834	109.4	448.5	44.6	1741	148.7	2127	258.3
	2009	279	44	305	32	162	14	2248	329	1668	122.7	395.2	40.3	1297	106.7	1940	258

Table 2 Male and Female Employment by activities cont. (thousands)

		Austria		Belgium		Finland		Germany		Italy		Netherlands		Spain		UK	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Service																	
Whole sale and trade	2007	305	340	309	280	156	154	2520	2788	2087	1454	654.2	556.8	1594	1534	2102	2005
	2009	298	352	300	275	149	147	2474	2780	2066	1380	600.6	545.1	1485	1505	2056	1933
	2011	290	342	314	274	150	154	2440	2792	1918	1334	559.6	525	1480	1482	2112	1939
Transportation and storage	2007	176	67	243	73	126	48	1552	596	965	291	373.9	137.6	907.2	269.9	2071	662
	2009	182	63.3	246	71	119	35	1505	577	971.3	285.2	317.2	102.3	749.8	173.9	1924	600.5
	2011	178	66	218	54	116	32	1376	458	870.1	203.7	301.3	88.2	728.3	171	1937	580.6
Accommodation and food	2007	93	166.5	76	74	23	62	591	835	591	562	166.5	185.1	652.4	798.2	581	717
	2009	96	160	76	67	23	62	616	867	573.9	592.5	159.7	175.5	636.8	786.4	620	739.7
	2011	96	155	79	70	24	58	606	867	588.4	600.7	160.3	175.5	643	758	651	806.6
Financial services	2007	69	66.1	88	75	17	34	642	661	395	269	145.9	126.5	266.9	233.1	649	614
	2009	74	69	82	76	18	33	654	657	377.2	271	130.4	110.7	266.8	220.7	634.7	600.2
	2011	83	68	83	78	20	33	634	655	362.6	286.4	125.2	93.3	244.5	220.1	644.3	528.7
Real estate	2007	187	176	230.1	185	172	136	2051	1857	1421	1122	669.4	434.3	1008	1009	1607	1345
	2009	214	195	248	198	165	122	2246	1980	1399	1204	654.3	390.6	956	986	1937	1513
	2011	216	216	224	195	165	122	2245	1896	1402	1200	668	415	989	1000	1996	1484

Table 2 Male and Female Employment by activities cont. (thousands)

		Austria		Belgium		Finland		Germany		Italy		Netherlands		Spain		UK	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Public administration	2007	145.1	120	232	200	44	64	1358	1281	703	462	339.6	227.4	665.1	485.4	896	1013
	2009	144	121	223	201	43	65	1311	1292	693	468.1	339.6	227.8	722.5	558.1	873.2	964.4
	2011	146	120	209	192	44	63	1264	1293	712.8	484.7	328.7	209.3	750.5	601.5	809	915.4
Education	2007	60	151	116	262	56	110	731	1501	407	1198	223	344.5	388	724.3	724	1921
	2009	72	176	120	268	54	110	751	1581	384.9	1170	229.4	363	410.3	769.7	790.9	2137
	2011	73.5	178	125	288	60	118	734	1685	362	1175	207.8	349.6	411.8	794.3	886.6	2242
Health	2007	81	265	129	406	42	331	1000	3298	512	1063	240.5	1093	288.6	940.5	686	2732
	2009	86	307	133	451	43	345	1061	3511	516.8	1155	253.3	1125	316.3	1036	811.5	2926
	2011	88.3	301	137	477	51	345	1098	3668	527.9	1156	231.5	1125	333.9	1129	862.6	3068

Source: OECD

Note: The table combines the data from ISIC rev.3 and ISIC rev.4, as most countries update the economic activities ISIC category from rev.3 to rev.4 from 2009. The data of France is not included here because it is only available from 2000 to 2006.

Table 3 Labour market expenditures (LMP) and other institutional indicators by country (2004-2008)

	Total LMP		Strictness of EPL	Rigidity of employment index	Trade Union density
	2004	2008	2008	2008	2008
Austria	1.97	1.77	2.62	24	29.1
Belgium	2.98	2.63	2.82	17	54.4
Denmark	4.23	2.47	2.35	7	66.3
Finland	2.88	2.07	2.01	41	69.6
France	2.59	1.96	2.73	52	7.6
Germany	3.39	1.93	2.95	42	19.1
Greece	..	..	2.93	47	24
Ireland	1.5	1.98	1.91	10	31.9
Italy	1.29	1.24	3.15	38	33.4
Luxembourg	1.09	1.01	2.71	56	36.5
Netherlands	3.11	2	2.92	42	18.8
Norway	1.39	0.67	2.38	44	52.6
Portugal	1.82	1.48	3.69	43	20.5
Spain	2.2	2.63	2.76	49	17.4
Sweden	2.35	1.38	2.58	38	68.3
The UK	0.61	0.53	2.18	10	27.1

Note: Total LMP refers to the total public expenditure on labour market programme (by % of GDP). Source: OECD; Strictness of EPL (employment protection laws): synthetic indicators of the strictness of regulation on dismissals and the use of temporary contracts. Source: OECD; The rigidity of employment index measures the regulation of employment specifically the hiring and firing of workers and the rigidity of working hours. This index is the average of three sub indexes: a difficulty of hiring index, a rigidity of hours index, and a difficulty of firing index. The index ranges from 0 to 100 with higher values indicating more rigid regulations. Source: World Bank Doing Business project (http://www.doingbusiness.org/); Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners. Source: OECD.

Figure 1: Spain[1]

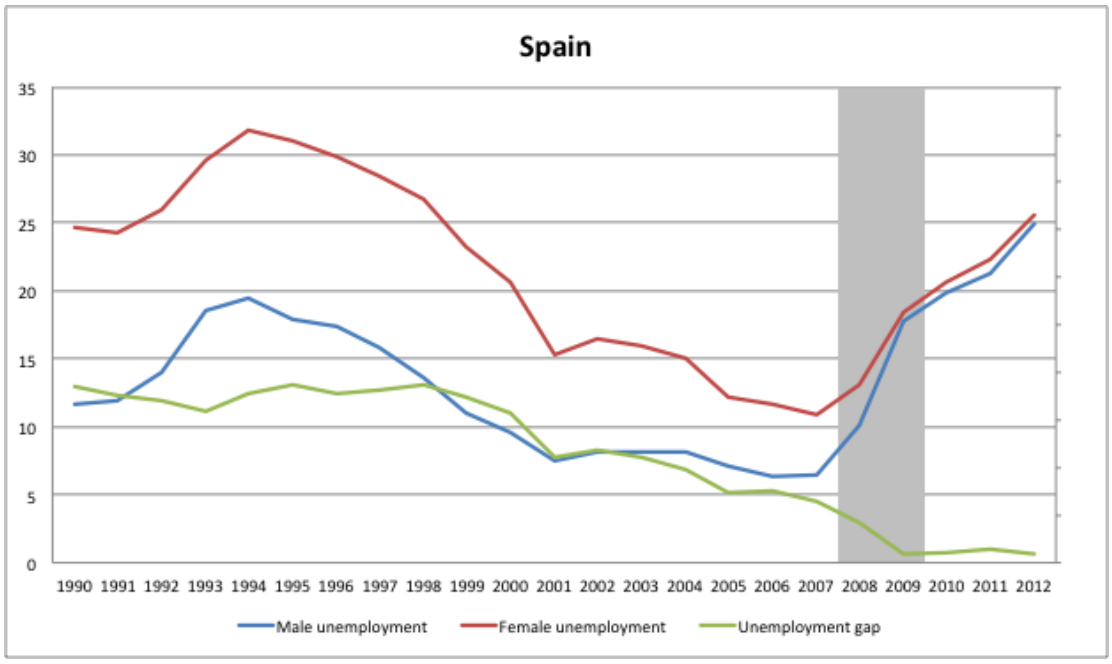
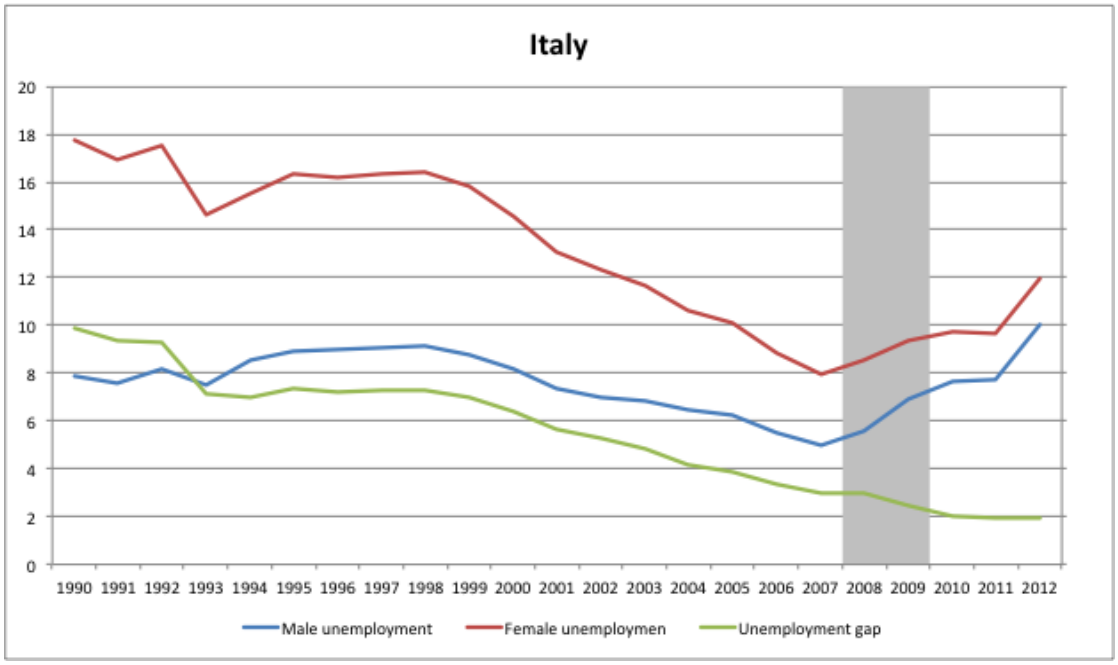


Figure 2: Italy



[1] Sources from OECD data.

Figure 3: The Netherlands

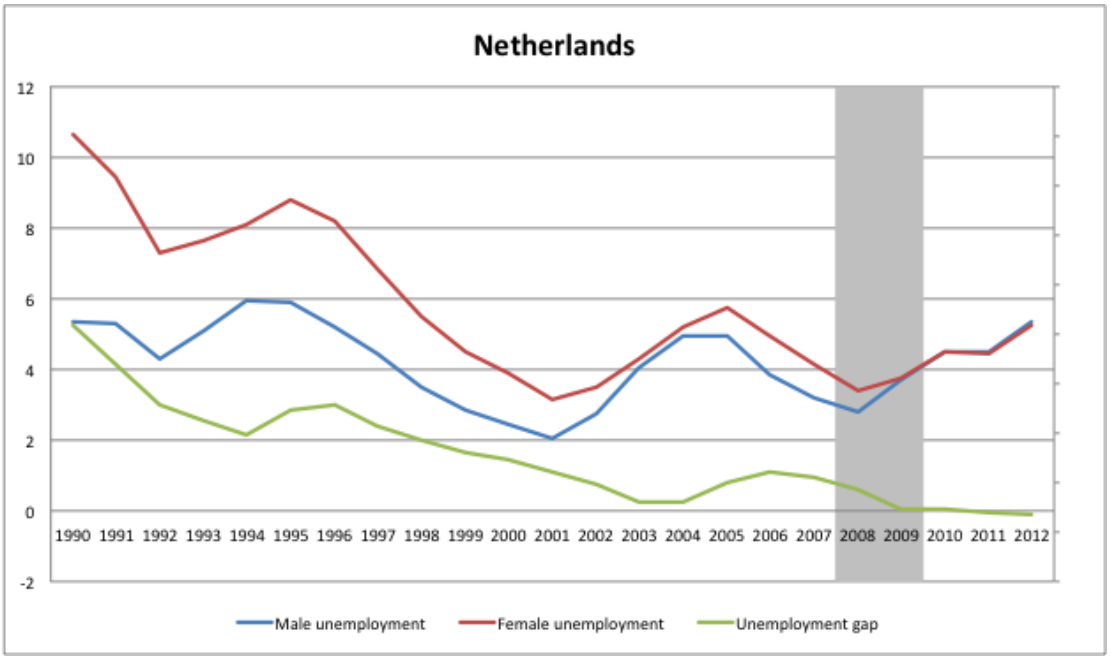


Figure 4: Portugal

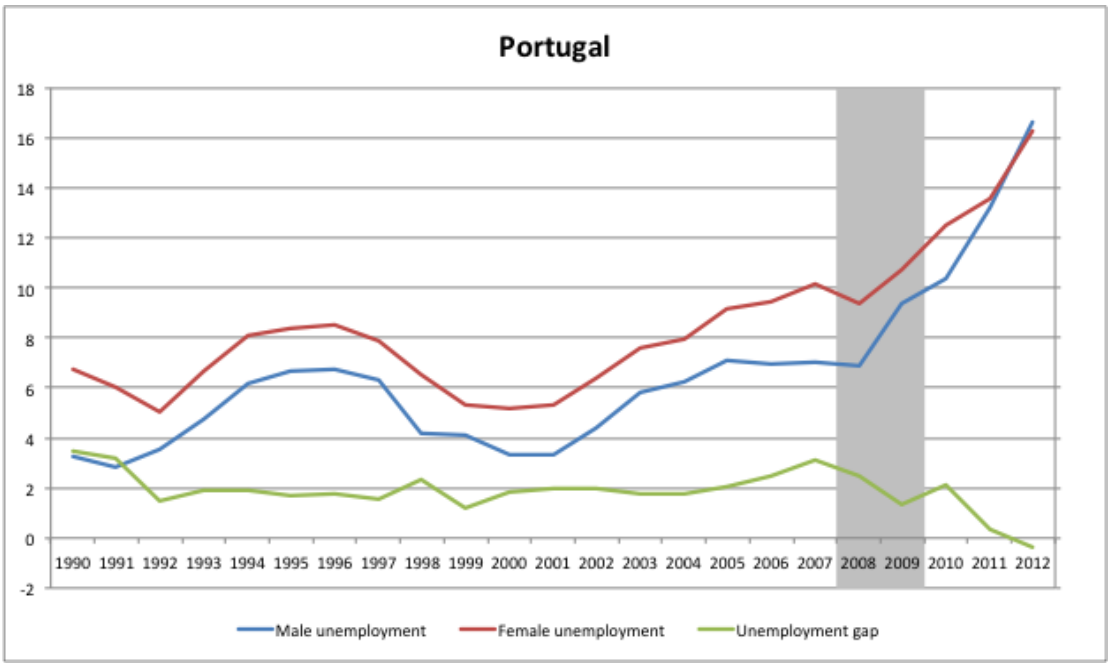


Figure 5: Belgium

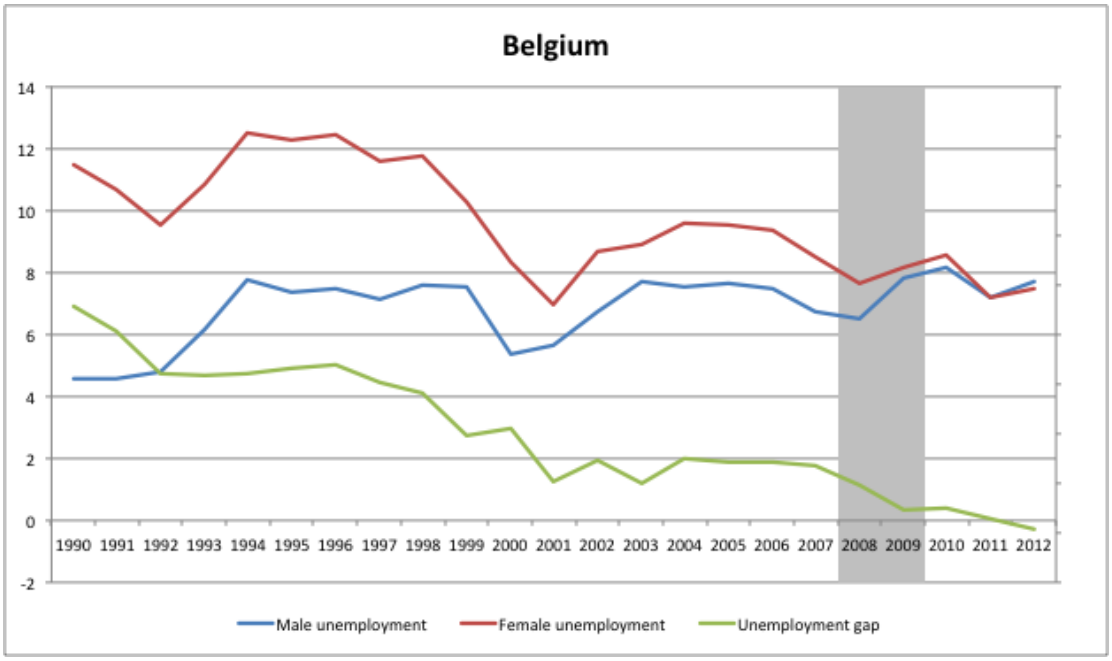


Figure 6: France

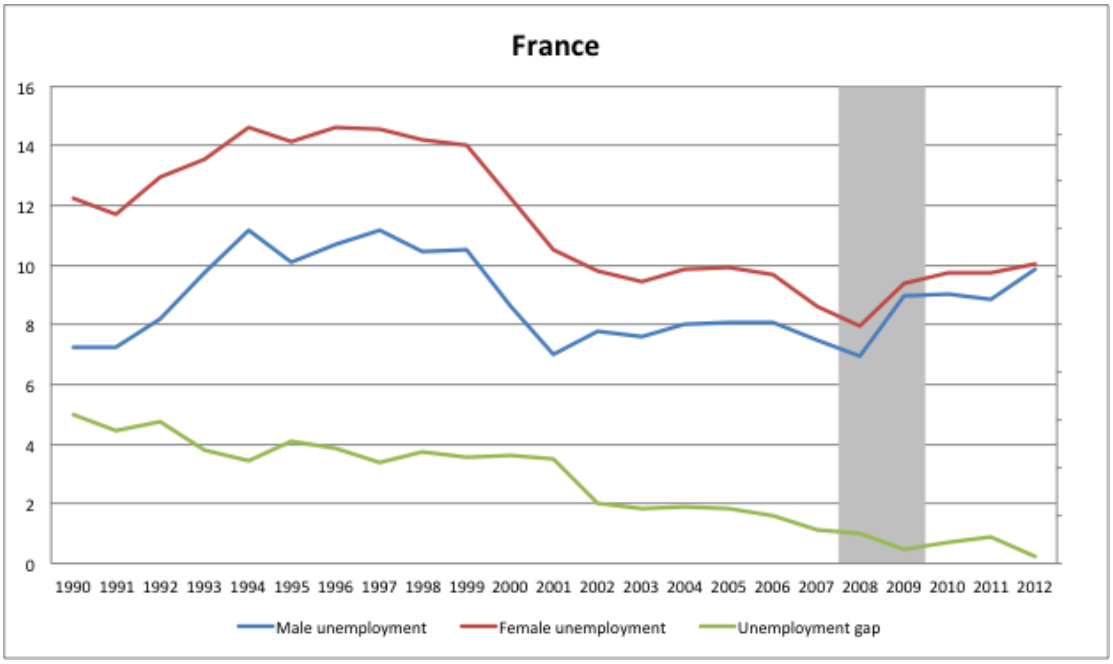


Figure 7: Germany

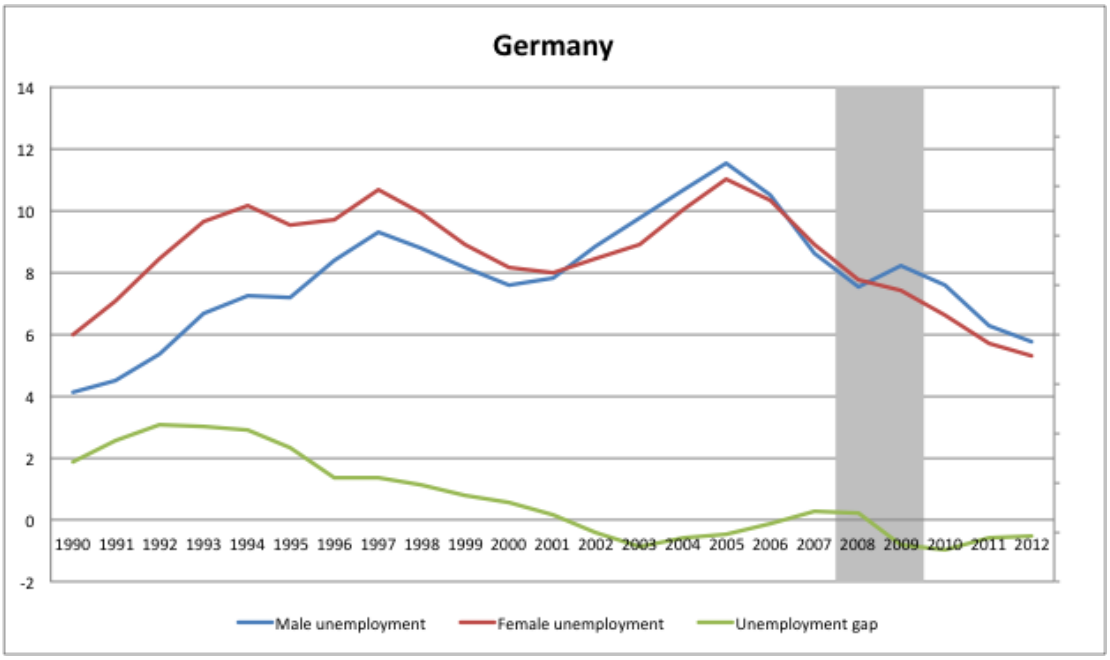


Figure 8: UK

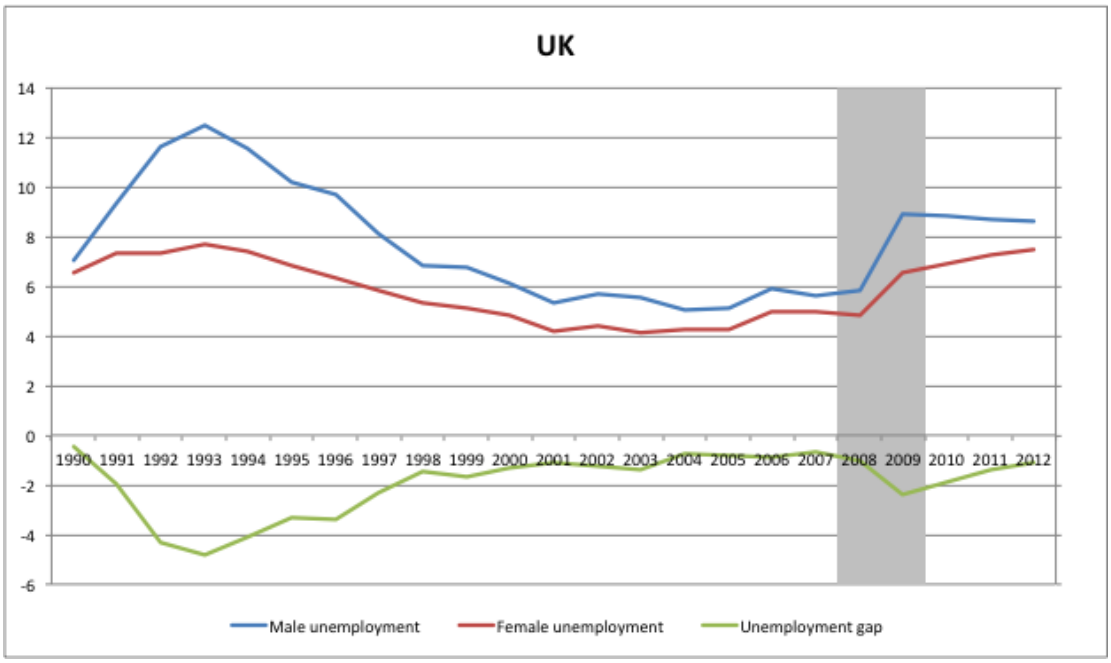


Figure 9: Sweden

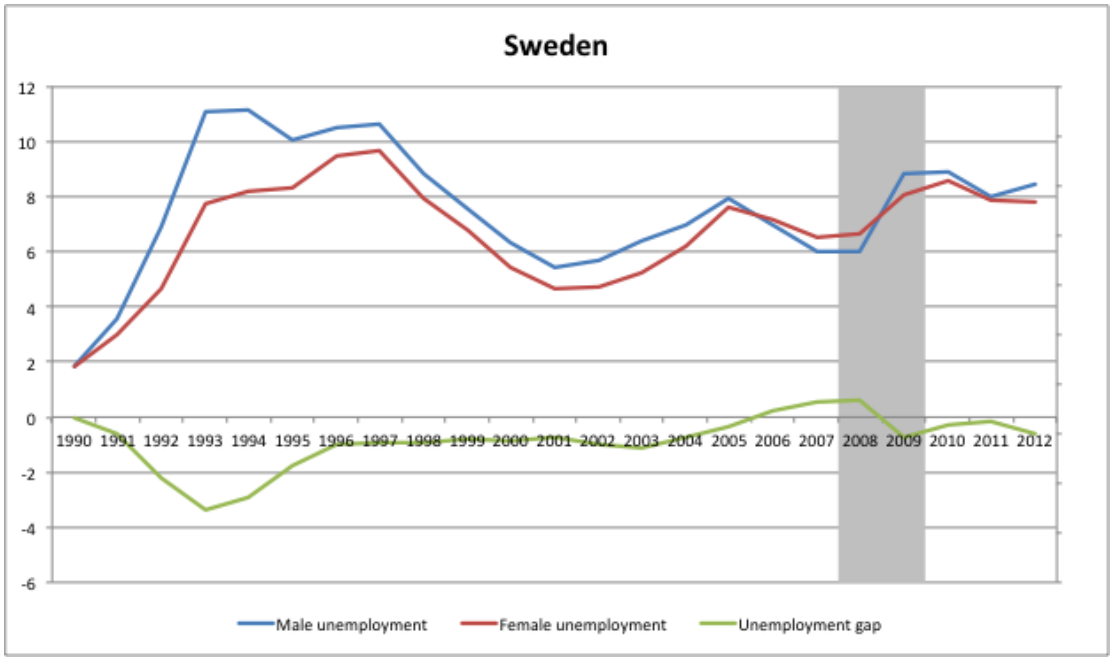


Figure 10: Norway

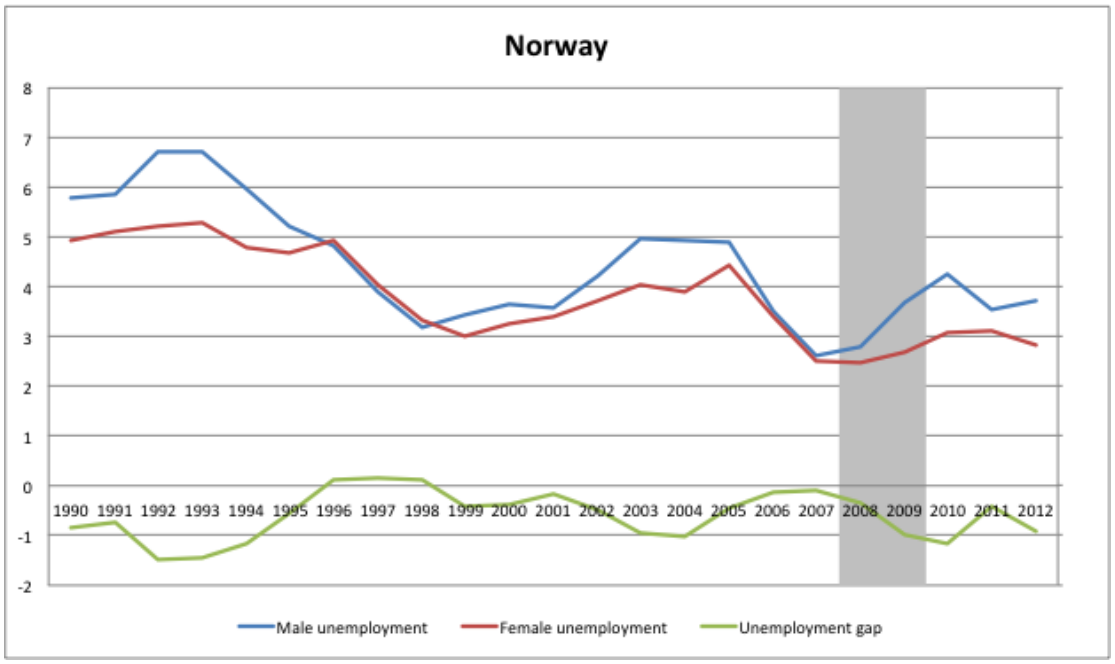


Figure 11: Finland

Figure 12: Austria

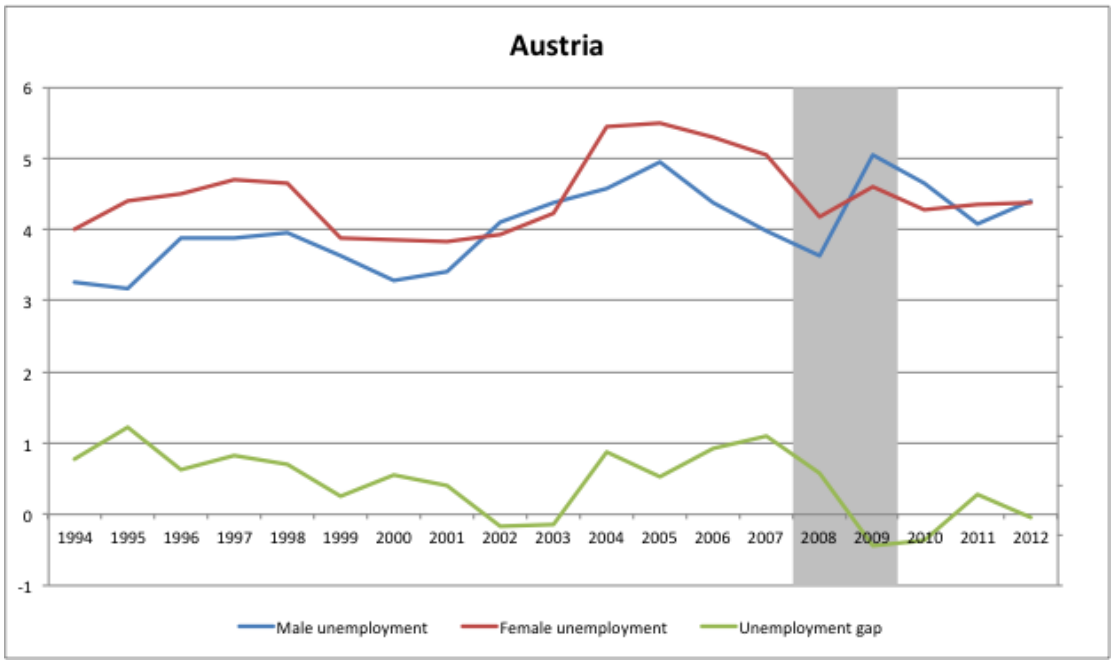
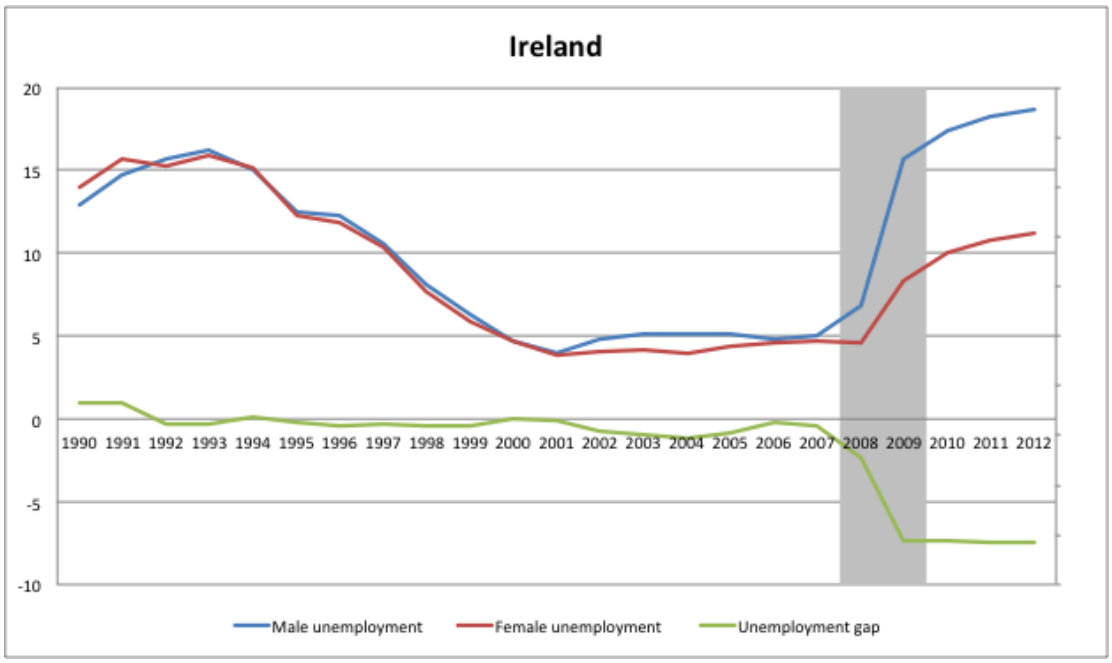


Figure 13: Ireland



2. Literature review

Being that Chapter 3 and Chapter 4 are focussing on different aspects of unemployment to study the gender differential of unemployment rate, this literature review chapter contains three parts. The first part will introduce the literature on aggregate unemployment gender gaps, while the second part focusses on existing labour market transition studies by gender, in preparation for the transition analysis in Chapter 4. In the third part, some possible determinants of labour force transition rates, as well as some relevant research on unemployment gender gaps, will be discussed. This part contains various research studies related to the topics at hand, and so I will briefly cover the main theories and empirical evidence.

2.1 Literatures on unemployment gender gaps

Compared to the research on gender gaps in income and labour market participation rates, the literature on gender difference in relation to unemployment rates is relatively minimal.

There is evidence that in many European countries with higher unemployment rates, female unemployment is significantly greater than for males. Indeed, Azmat, Güell and Manning (2006) investigated the differentiation in the gender gap in the unemployment rate for many OECD countries during the late 1990s. They indicated

that unemployment gender gaps are found to be smaller in countries associated with better labour market attachment, to be larger amongst those countries with greater gender gaps in labour market experience, and to decrease gradually in countries which have seen an improvement in female labour market attachment. This emphasises the importance of human capital difference as a principal reason for the gender gaps in unemployment rates. Moreover, they mainly focussed on the Mediterranean countries with higher gender gaps, finding that gender gaps in flows from employment to unemployment (E→U) and from unemployment to employment (U→E) are both quite large, and represent the underlying source of aggregate unemployment gender gaps.

Based on the findings of Azmat, Güell and Manning (2006), unemployment gender difference has been further investigated for an additional number of countries. Motivated by the significant gender differences in unemployment in new EU members like the Czech Republic, Bicakova (2010) used EU LFS data to analyse the determinants of gender unemployment gaps amongst new EU member countries over the last decade. Unlike Azmat, Güell and Manning (2006), the research by Bicakova (2010) focussed on the effect of cost of children on unemployment gender gaps, that is, countries with the biggest unemployment gaps show the highest labour market cost of having children. Indeed, this means that there is a higher unemployment probability and a lower transition rate from unemployment to employment. The substantial gender unemployment gap is mainly the result of gender difference in

work experience and employers' expectations of women after childbirth, both of which are consistent with human capital accumulation theory.

Livanos, Yalkin and Nunez (2009) examined the labour market status of females in the UK and Greece respectively. In particular, their study aimed to assess whether the gender difference in employment status can be explained by employee's human capital or by discrimination in the labour market. Consequently, they found clear evidence of gender difference in labour market status in both countries, with a larger difference in Greece than in the UK. In addition, they discovered evidence of discrimination in both of the labour markets.

In addition to the above research, certain other aspects of gender gaps in unemployment rates have also been addressed. Using data for several OECD countries, Petrongolo and Olivetti (2006) linked gender income gaps with employment rate gaps, thus concluding that gender income gaps are negatively correlated with gender employment gaps across countries, mainly because of the non-random selection of women into work. If women who are employed tend to have relatively high-wage characteristics, low female employment rates may become consistent with low gender wage gaps simply because low-wage women would not feature in the observed wage distribution. Therefore, the key to understanding differentiation in gender income gaps across countries is the differentiation in gender employment gaps.

Up until now, the difference between female and male unemployment rates has often been used to represent gender unemployment differentiation. However, Queneau and Sen (2010) introduced a new measure, namely the ratio of female unemployment to male unemployment. They then estimated whether the gender unemployment gaps for eight OECD countries are persistent. Their empirical results implied that the unit root test is to be rejected for all eight countries with the exception of Australia; their conclusion was that the level of persistency is relatively low for these countries.

In general, existing literature concerning the determinants of unemployment gender gaps employs either cross-sectional analysis or longitudinal analysis. Cross-sectional analysis essentially concludes that human capital accumulation can partly explain the gaps, with family reasons (mainly marriage and children) shown to have a larger impact on women than men. At the same time, longitudinal analysis mainly shows that the convergence of women and men's labour force attachment is able to explain the narrowing of gender gaps. This may well imply (and it seems to be true in many countries) that over the past several decades women have chosen to delay marriage and the birth of their first child. They may also choose to have fewer children or no children at all. At the same time, certain exogenous factors have given women more time and options to go to work. For example, the growing service sectors have led to demand for more female workers; in addition, the flexible working arrangement in many European countries gives women more flexible options to work, and the

maternity pay and leave policy enables women to have children without losing their jobs. As a result, women become more attached to the labour force over time, which contributes to lower female unemployment rates.

2.2 Recent research on labour market transitions

There are three labour market states: employed (E), unemployed (U) and non-participation (N). From one period to another, an individual can stay in the same labour market state (E→E, U→U, and N→N) or transit into any of the other two states (E→U, E→N, U→E, U→N, N→E, and N→U). For example, if one person is not in the labour force in the first period (N), but during the second period he starts to look for a job, he may get a job directly (N→E), or experience a spell of unemployment (N→U). The flow rate is therefore the probability of moving from one state to another.

The aggregate unemployment rate is defined by U/E+U, while each component is determined by flows into and out of the labour force and flows between unemployment and employment. If there are gaps between male and female unemployment rates, then there should also be evidence of gender differential in these flow rate; indeed, this is why Chapter 4 uses micro data (EU-SILC) to analyse labour market transition rates. More discussion about the relation between aggregate unemployment rate and labour market transition rates is provided at the beginning of Chapter 4.

Most research on workers' flows originates in the US. Indeed, recent studies in the US have tried to use flow rates estimation to explain unemployment changes. Among these studies is that of Sahin, Song and Hobijn (2010), who examined how the

recession has influenced the labour market status of males and females in the US given the severe unemployment gender gap in the recession that began in December 2007. Unlike women, men are found to suffer from far more substantial adverse effects during the recession. Due to the worsening of male-dominated heavy industries, as well as the declining household wealth and tightening credit during the recession, there tends to be a higher male unemployment inflow rate, thus leading to a higher increase of male unemployment rate and the increase of female unemployment rate. Indeed, all of this results in a lower unemployment gender gap during the crisis in the US. Instead of calculating the flow rates, Albanesi and Sahin (2013) used a calibrated three-state search model of the labour market. As more females become attached to the labour force, they are more likely to join the labour force and stay longer to find jobs, thus potentially increasing female employment. And vice versa, declining male labour force attachment might lead to higher unemployment for males. This would result in gender unemployment gaps becoming smaller over time. The researchers showed that the rise in female labour force attachment and the decline in male attachment can mostly account for the declining of the gender unemployment gap in the US labour market.

There are relatively fewer studies about workers' flow rates in the UK and other European countries, which is due to the fact that, unlike the Current Population Survey (CPS) in the US, many European micro datasets do not track individuals' labour market states over time. Elsby, Smith and Wadsworth (2011) have used the UK

Labour Force Survey to estimate worker flows amongst labour market states over the past 35 years. Although they used cross sectional data, the LFS asked individuals about their labour force status a year prior to the interview date. Indeed, this method allowed the participants to recall information so as their reported current status, gross flow and transition rates could then be calculated. For example, the gross employment to unemployment (E→U) flow is simply the sum of respondents who report that their current status is unemployed, while their recalled status one year prior to the survey was employed. Thus, the associated transition rate is just the above gross flow divided by the number whose recalled status was employed.

Elsby, Smith and Wadsworth (2011) used the three-state approach to decomposing changes in unemployment. The decomposition across groups (by gender, age and education attainment) provides a sense of how differences in average flow transition rates across groups map onto differences in their respective group-specific unemployment rates. Results concerning gender show that men having to face higher unemployment rates than women can be attributed, in large part, to the fact that women are more likely to exit from unemployment and leave the labour force entirely (U→N). In other words, as some females choose non-participation and stop receiving wages, the unemployment rates will not include them.

Baussola and Mussida (2011) have deconstructed the difference by gender in the unemployment rate using gross labour market transition data for Italy. By calculating the raw transition rates, they found that the flows from non-participation to employment represent a non-negligible component of the overall inflow to employment. Thus, they suggest that the inclusion of non-participation would give a more precise decomposition of gender gaps – a conclusion which is in stark contrast with that drawn by Azmat, Güell and Manning (2006). They also conclude that, for both genders, there is a significant reduction in the likelihood of successful entry into the labour market and an increase in exit probability from employment to unemployment, which is seen as a sign of worsening labour market conditions due to the deepening economic crisis.

2.3 Possible determinants of labour market transitions and related research of unemployment gender gaps

In this section, literature on human capital and structural change will be discussed, as both of these are possible determinants of labour market transitions. Following this, three research topics relating to unemployment gender gaps, namely gender discrimination, the household labour supply model, and the search and matching model, will also be briefly discussed.

2.3.1 Human capital and education

On the demand side of the labour market, firms are more willing to hire females with a higher education level. With regard to supply, on the other hand, higher education attainment also encourages females to enter the labour force. According to the human capital theory, education level affects wages, and hence also affects the gains from working and the opportunity costs of leaving the labour force. Furthermore, the years of schooling may affect job offer arrival rates. All of these factors imply that education affects female labour market transitions (Bloemen and Kalwij, 2001). Females with a higher education level are less likely to leave the labour market (and more likely to enter the labour force), which is a sign of increased labour force attachment. Researchers also found that labour force participation is strongly related

to educational attainment, with greater schooling being associated with increases in the probability of labour force participation. Ollikainen (2006) found that education plays a major role in promoting equality in the labour market. There is a strong positive correlation between education and the probability of employment for both men and women. However, for women the benefits of education are particularly substantial.

Average female education attainment is different across countries and regions. Dolado, Felgueroso, and Jimeno (2001) have shown that the education level of the EU female population is slowly converging on that of the US. Approximately 50% of the difference between the employment rates in the US and the EU can still be attributed to differences in the educational attainment and employment rates of women aged 25-54. This evidence supports the notion that education would still be an important factor contributing to the change of female employment and unemployment in European countries.

2.3.2 Structural change

There is less research regarding the effect of structural change on labour market transition rates. DiPrete and Nonnemaker (1997) found that structural effects have clearer interpretations for male mobility than for female mobility. Men are less likely to exit industries or occupations for another job in response to expansion and are more

likely to exit for another job in response to contraction, which they call the "push" effect. Women do not show this form of sensitivity to occupational and industrial expansion and contraction.

The authors DiPrete and Nonnemaker (1997) forwarded two explanations for these gender differences. The first lies in the nature of the pushes and pulls that cause women to change industries. Women may face a lower average earnings penalty when changing industries than men. The second explanation is linked to the gendered nature of the forces that push men and women out of their industry of origin. The most publicised job displacements have involved production jobs in manufacturing industries, where men have dominated. Displaced women are arguably more likely to be in jobs made redundant by computerisation, such as telephone operators, bank tellers, and other clerical workers. As a consequence, job displacements would have been more strongly correlated with industrial contraction for men than for women. However, both men and women are less likely to exit employment from expanding occupations and industries, while both genders are more likely to exit employment from contracting occupations and industries.

One implication is that such a "push" effect is stronger for men, especially during the recessions, where the larger contractions in manufacturing and construction industries let male workers leave the original industry and become unemployed. Therefore, men's transition rates out of employment should be greater than women's (both E→U

and E→N), thus giving rise to larger increases in male aggregate unemployment rates, which is true for each recession.

Bachmann and Burda (2010) found a significant increase in structural change and turbulence, particularly since 1990. The secular rise of European unemployment since the 1960s is hard to explain without making reference to structural change. This is especially true in Germany, where industrial employment has declined by more than 30% and service sector employment has more than doubled over the past three decades. In growing sectors, there is evidence that net structural change was driven by accessions from non-participation rather than unemployment; contracting sectors reduced their net employment primarily via lower accessions from non-participation. One should note that the above two articles use the terms "turbulence" and "mobility", both of which are actually different from net transitions. However, according to the above evidence, structural change does have different effects on male and female transition behaviour.

Moreover, Groshen and Potter (2003) studied the recovery since the early 2000 recession in the US. Unlike previous recessions, the recovery has seen steady growth in output but no corresponding rise in employment. By looking at layoff trends and industry job gains, they found that most of the jobs added during the recovery have been new positions in different firms and industries, not rehires. As such, structural

change, which permanently relocates workers from certain industries to others, may help to explain the stalled growth in jobs.

The trend of structural change is obvious across countries; goods-producing sectors are contracting, while service sectors are growing. This structural change not only explains the different male and female labour market transitions over the long run, but can also help to understand the different labour market behaviour exhibited by men and women during recessions and recoveries. It is also predictable that job recovery after this recession should be slow as well, as creating jobs takes longer than rehiring.

2.3.3 Gender discrimination

Gender discrimination is one of the relevant topic of female and male unemployment, and also one of the possible reasons for unemployment gender gaps. Thus, this section will briefly review the definition of, approach to, and literature on gender discrimination. Economic research on the presence of discrimination has focussed largely on black-white and male-female wages and employment (or occupational) disparities. Given the racial or gender gaps in wages or employment, some parts of the gaps can be explained by average group differences in productivity, which are linked to characteristics (a human capital gap). In addition, some parts are due to average group differences in treatment (a discrimination gap, or ‘unexplained’ gap).

Generally speaking, the more of the gap that can be explained by human capital differences, the easier it becomes to assert that labour markets function in a non-discriminatory manner.

According to Darity and Mason (1998), there are two widely used approaches when it comes to finding evidence of gender discrimination. One approach is to estimate a regression with wage levels or employment status as the dependent variable while characteristic factors like years of education, experience, region, and dummy variables for gender are used as explanatory variables. If the gender variables' coefficients are statistically significant and negative after controlling for other factors, then this result is taken as evidence of gender discrimination in the labour market. The second approach is to apply the Blinder-Oaxaca decomposition procedure (Oaxaca and Ransom, 1994), which could decompose the gross (unadjusted) wage differentials (or employment differentials) into discrimination (treatment) and productivity (human capital) components.

In the 1980s and 1990s, many studies focussed much more on wage differentials than employment differentials. There has been a general narrowing in wage differences between men and women in the United States (Blau et al., 1986). One of the reasons is that gender gaps in human capital, especially the gap in actual market experience, have declined. The other reason is that, as the legal pressure succeeds in expanding the range of job opportunities for women, the level of gender discrimination has

declined (Blau and Kahn, 1997). However, there is strong evidence of a ‘family gap’ in women’s earnings, which is a gap between women with children and those without. Waldfogel (1998) showed that women with children are paid lower than women without children. In contrast, married men (who are much more likely to have children than unmarried women) receive a wage premium.

One shortage of many existing studies on gender discrimination is that researchers take the ‘unexplained gap’, that is, the difference in wages after controlling for personal and job characteristics, as evidence of discrimination. As pointed out by Altonji and Blank (1999), the presence of unexplained differences in male/female or black/white wages is certainly consistent with the presence of discrimination, although it does not provide a very direct test of the hypothesis. To investigate the presence of discrimination, Altonji and Blank (1999) suggested that the studies should be able to compare the outcomes of individuals in the same job who are identical in all respects relevant to performance, but who differ only in race or gender. One experimental study (Neumark, 1996) assessed identically described male and female applicants applying for jobs. The study documented extensive discrimination against women applying for jobs as waiters in restaurants.

2.3.4 Household labour supply model

The household labour supply model has been used to shape our understanding of the

household decision variables, such as consumption, labour supply, household productivity, and fertility. Indeed, this is another topic related to gender gaps in unemployment rates.

On the theoretical side, the so-called unitary model, which is the standard and most common household labour supply model, has been applied to deal with the analysis of household behaviour assuming that the family as a whole is the basic decision-making unit. There have been various calls for the introduction of alternative frameworks, since the traditional unitary model does not provide an adequate context to address these issues. These models are all based on game theory concepts, since they consider that household behaviour is the result of an interaction process among family members.

The models differ in how they model the interaction process. Normally, these can be distinguished between models that consider the interaction as a non-cooperative game (Ashworth and Ulph, 1981; Browning, 2000), and those models using a cooperative approach (Manser and Brown, 1980; McElory and Horney, 1981). In cooperative models, household behaviour is assumed to be the outcome of a cooperative game among the family's decision-making members, which provides a more suitable framework for intra-household analysis than the non-cooperative models. The cooperative models have been further generalised by Chiappori (1988), Bourguignon et al. (1993), Browning and Chiappori (1998), and Chiappori and Ekeland (2009),

who have developed a “collective” framework. Indeed, it can be proven that this collective model’s minimal setting is sufficient to generate strong testable restrictions on behaviour. Furthermore, under additional restrictions, the collective model allows one to identify the characteristics of the underlying structural model (i.e., individual preferences and the decision process) from observed behaviour.

While the collective model provides a suitable theoretical framework to analyse household behaviour, it needs to be generalized to take into account variables that may affect the distribution of intra-household power (Chiappori et al., 2002), where they are defined as ‘distribution factors’. These factors are defined as variables that can affect the intra-household decision process without influencing individual preferences or the joint consumption set, for example, the sex ratio in the marriage market, and divorce laws. The impact of these two factors on the intra-household decision process and labour supply are supported by empirical evidence.

Becker (2009) stated that the marriage market is an important determinant of intra-household utility distribution. With this approach, the sex ratio, which refers to the relative supplies of males and females in the marriage market, could crucially determine the state of the marriage market. If there is a relative scarcity of women, or in other words, the sex ratio is favourable to the wife, then the distribution of gains from marriage will be shifted in the wife’s favour, which may in turn affect intra-household decisions. Grossbard-Shechtman (1993) and Grossbard-Shechtman

and Neideffer (1997) used US data and found that an increase in the sex ratio (scarcity of women) reduces the labour force participation of married women and their hours worked. Angrist (2002) used data on immigrants to the US and also found that higher sex ratios are associated with lower female labour participation.

Legislation may also play a role in the decision process. Laws governing divorce influence the ex-partners' level of income and the assignment of property rights when a marriage ends. As a result, these laws will affect the spousal relative bargaining process, and in turn are likely to influence distribution and outcomes within the household. Grey (1998) found significant relations between changes in US female labour supply and the adoption of unilateral divorce in the 1970s. Similarly, Stevenson (2008) assessed how the legal changes pertaining to divorce contributed to the rise in women's labour force participation. Results showed that unilateral divorce led to an increase in both married and unmarried female labour force participation, regardless of the pre-existing laws on property division.

2.3.5 Search and matching model

While the traditional neoclassical labour market models are unable to explain long spells of possibly involuntary unemployment, search and matching models, with their various extensions, have proven to be a more useful tool with which to develop an understanding of unemployment durations and the effectiveness of labour market

policies aimed at bringing the unemployed back to work (Eckstein and Van den Berg, 2007; Mortensen and Pissarides 1999). These models can jointly consider labour supply issues related to unemployment, job mobility and wage dispersion as well as labour market discrimination and unemployment wage gaps (Wolpin, 2003). Therefore, as a topic closely related to the unemployment gender gaps, search and matching models will be discussed in this part. Several theoretical models related to job search and matching will be briefly discussed here, followed by some empirical studies of each model.

The *standard and classic search model* of Mortensen focusses on the basic search behaviour of unemployed workers. Each time the unemployed worker receives a job offer, he/she decides whether to accept the offer based on a previously determined set of criteria. In this way, the job search theory will be able to model the individual's behaviour of whether to participate in the labour market and whether to change or leave jobs. Flinn and Heckman (1982) were the first to structurally estimate the model. They used US data and calculated the parameters of the model, such as job offer arrival rate, and the job acceptance probability. They also found that the model fits the aggregate unemployment rate for this demographic group in the population from CPS data very well. Van den Berg (1990) specified and estimated a continuous time search model where the unemployment benefit levels change for an interval of two years. The main findings were that the changes in the benefit levels during the interval of two years, and particularly the end period level, have a significant impact on

unemployment duration for low and middle level education groups.

Following this, Burdett (1978) extended the classical search model by allowing employed workers to search further for better jobs after a job has been formed. The *search on the job model*'s basic setup is identical to that of the classical search model above. Wolpin (1992) used this model in order to study the importance of work experience on wage offers for blacks and whites during the first five years after graduating from high school. Wolpin found that the blacks have higher job offer rates while unemployed and employed. Since the observed wages of blacks increase less than those of whites, work experience affects the lifetime earnings profile of people more than the job offer arrivals in employment.

An important extension of the simple search model is a model which concerns the situation when a worker meets a firm; indeed, the model samples a value of the match between the two parties (Diamond and Maskin, 1979; Jovanovic, 1979; Pissarides, 1990). The value of this match is a random variable that represents worker productivity, and is sampled randomly from a given distribution function. This is called *the search-matching-bargaining model.* Eckstein and Wolpin (1995) interpreted the bargaining power parameter in the search-matching-bargaining model as a source of labour market discrimination between blacks' and whites' gaps in wages and unemployment. Their results indicated that the bargaining power parameter for whites is between 40% and 56% higher than that for blacks. As a result, discrimination

resulting from the difference in bargaining power can account for the entire wage gap (as an upper bound measure) between blacks and whites with the same schooling level.

3 Chapter 3

3.1 Introduction of Chapter 3

As with the earlier introduction, I recall that aggregate unemployment gender gaps in some European countries have narrowed significantly over the last 20 years. According to the literature review, human capital accumulation is considered one of the determinants of these changes. As such, this chapter aims to estimate the effect of the level of education attainment, as well as economic status, on the unemployment gender gaps and on male and female unemployment rate separately, being that education levels have been widely used to measure the accumulation of human capital.

In general, aggregate data such as unemployment rates by gender, education attainment by gender, and GDP per capita, are much easier to obtain than micro data, both in terms of the number of countries available and in terms of the time range. As preparation for the next chapter, where micro datasets are used to estimate the transition rate level, this chapter will focus on using macro data.

The present chapter will start in Section 3.2 with an introduction to the data, while in Section 3.3 the basic regression on unemployment gender gaps is presented with the main variables to provide some initial ideas about the determinants of gender gaps.

Following this, in section 3.4 I have estimated the female and male unemployment rate separately with country specific and time specific education variables to obtain further results. Finally, Section 3.5 present the conclusion.

Generally speaking, I have found that the closing of the unemployment gender gap in Mediterranean countries was due to the convergence in the labour market attachment of men and women, and largely due to the improvement of female labour market attachment. In addition, economic status has played a more important role, particularly during the recession periods.

3.2 Data

The data used in the estimation are sourced mainly from the OECD and World Bank statistics. The balanced panel data includes 13 European countries: Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden and the UK. The time length of the balance panel is 17 years from 1995 to 2011. In general, aggregate data such as unemployment rates by gender, education attainment by gender and GDP per capita are much easier to access and obtain than micro data, both in terms of the number of countries available and in terms of the time range. By estimating the effect of education attainment and economic status on the evolution of aggregate unemployment rate by gender, this chapter provides a brief

introductory idea of the determinants of the main variables in relation to the aggregate unemployment rate difference by gender. Indeed, this could also aid in preparation for the transition analysis in the next chapter.

The estimation will focus on the effect of education and economic status on unemployment gender gaps, as well as on male and female unemployment rates respectively. The dependent variables are therefore the male and female unemployment rates by ILO definition, and the corresponding gender differences for people aged 15-64. The independent variables are education variables and variables for real GDP per capita. Education variables are originally from the World Bank statistics, and show the percentage of the male and female labour force with primary, secondary, and tertiary education respectively. I use this data to show the overall male and female education level in one country. The real GDP per capita variable is also obtained from the World Bank GDP per capita, PPP (constant 2005 international $). New variables have been created by the above original variables for estimation, with the details to be found in the next section. In Appendix Table A.1, I have reported the summary statistics for the main variables used in this chapter.

3.3 Determinants of Gender Unemployment Gap – an initial idea

In order to get an initial idea of the determinants of gender unemployment gaps, the equations to be estimated are:

$$GAP_{it} = \beta_0 + \beta_1 \cdot FTP_{it} + \beta_2 \cdot MTP_{it} + \beta_3 \cdot GDP_{it} + \varepsilon_{it} \quad (3.1)$$

$$GAP_{it} = \beta_0 + \beta_1 \cdot FSP_{it} + \beta_2 \cdot MSP_{it} + \beta_3 \cdot GDP_{it} + \varepsilon_{it} \quad (3.2)$$

where GAP_{it} is the gender unemployment gap (female unemployment rate – male unemployment rate) for the labour force aged 15-64 for country i in year t. Meanwhile, on the right hand side, the education and economic status variables are used as explanatory variables.

Firstly, education variables measure the distribution of the relative education level (tertiary education, secondary education, and primary education) amongst the corresponding sample. In the above equations, FTP_{it}, MTP_{it}, FSP_{it}, MSP_{it} are education variables, which are calculated as follows:

$$FTP_{it} = \frac{\text{percentage of tertiary educated people in the female labour force}_{it}}{\text{percentage of primary educated people in the female labour force}_{it}}$$

$$MTP_{it} = \frac{\text{percentage of tertiary educated people in the male labour force}_{it}}{\text{percentage of primary educated people in the male labour force}_{it}}$$

$$FSP_{it} = \frac{\text{percentage of secondary educated people in the female labour force}_{it}}{\text{percentage of primary educated people in the female labour force}_{it}}$$

$$MSP_{it} = \frac{\text{percentage of secondary educated people in the male labour force}_{it}}{\text{percentage of primary educated people in the male labour force}_{it}}$$

The summary graphs for the percentages of each education level in the male and female labour force are shown in Appendix Figure A1.1 to Figure A13.2. Firstly, it is obvious that, for almost all countries (except for Germany, Norway, and Sweden) there has been a significant decline in percentages of primary educated males and females in the corresponding labour force during the past two decades. Secondly, in many countries, there appears to be a steady increase in the percentage of tertiary and secondary educated people in the labour force. In countries like Spain and Italy, the increase in the percentage of tertiary educated females in the female labour force is larger than the increase of tertiary educated males in the male labour force. From this evidence, it is expected to see increasing education variables (FTP_{it}, FSP_{it}, MTP_{it}, and MSP_{it}) over the sampling period. Moreover, in some countries like Spain and

Italy, the variation of FTP_{it} might be more substantial than the variation of MTP_{it}.

In the above calculations, the percentages of each education level in the male or female labour force sample are computed directly from the World Bank dataset. The reason for using these ratios, instead of direct percentages of male and females with different levels of education in the labour force, is that the percentages are not comparable across countries. Due to historical and institutional reasons, some countries (such as Scandinavian countries) have had a higher proportion of tertiary educated people for decades, while other countries have not. What is important is the education distribution across countries, and how this distribution changes over time. As such, these ratios can be used to measure this distribution.

The definition of these percentages should be interpreted with caution. For instance, as more women in the overall population are receiving a tertiary education over time, women with this education level may exit or enter the labour force. Thus, FTP_{it}, which is the percentage of tertiary educated people in the female labour force, cannot accurately measure the female tertiary education percentage in the overall population. Indeed, the expectation is that there will be more variation in this variable than the percentage of females with tertiary education in the population. Due to the data availability, FTP_{it}, FSP_{it}, MTP_{it}, and MSP_{it} are the best measurements so far, and could partially indicate the percentage of certain educated people among the entire population.

It should be noted that FTP_{it} and FSP_{it} have the same component: the percentage of primary educated people in the female labour force. In addition, MTP_{it} and MSP_{it} have the same percentage of primary educated people in the male labour force in their expression. To avoid perfect multicollinearity, FTP_{it} and FSP_{it}, as well as MTP_{it} and MSP_{it}, cannot be used in the same estimation equation.

The variable GDP_{it} is the measurement of economic status for country i in year t. However, real GDP per capita is not used directly here, being that different countries have different income levels and price levels, and thus it might not be comparable across countries. With this in mind, I have chosen to use an index with 2005 as the base year (the index in 2005 is 100). The reason for using 2005 as the base year is that this year is the period right between economic boom and economic recession, which can be treated as a 'stable or normal' economic period. The ratio of each year's real GDP per capita and real GDP per capital in 2005 would be treated as a comparison of GDP with a fixed benchmark. Therefore, the variable GDP_{it} can be seen as a proxy for economic status:

$$GDP_{it} = \frac{\text{real GDP per capita}_{it}}{\text{real GDP per capita}_{i2005}} \times 100$$

The above equations (3.1 and 3.2) are estimated as both fixed effects and random effects. I run a Hausman test in order to choose between fixed and random effects, where the null hypothesis is that the preferred model is random effects, alternatively the fixed effects. It essentially tests whether the unique errors are correlated with the regressors; the null hypothesis is that they are not correlated. The test statistics for Equation 3.1 and Equation 3.2 are 0.0949 and 0.1096, meaning that the null hypothesis cannot be rejected at 5% significance level. Thus, the Hausman test shows that the random effect is preferred to the fixed effect. Moreover, the Breusch-Pagan Lagrange multiplier (LM) test is applied to decide between random effects and a simple OLS regression. The null hypothesis for the LM test is that variances across countries are zero; that is to say, there is no significant difference across countries (no panel effect), and as a result, OLS regression is preferred to random effects. The LM test statistics for the two equations are 0.0000 and 0.0006, which rejects the null hypothesis and shows that random effect is preferred to OLS. According to the above two test results, the remaining regressions in Table 3.1 and 3.2 are all estimated with random effect.

The regression results are shown in Table 3.1 and 3.2. Since the sample includes 13 countries and 17 years, the estimated coefficients would represent the average variable effects upon unemployment gender gaps across all 17 countries and over time.

In Table 3.1, the variable female tertiary/primary (FTP_{it}) measures the relative proportion of tertiary educated females compared to primary educated females in the female labour force. For example, take the first coefficient from column (1). If the ratio of the percentage of tertiary educated people and the percentage of primary educated people in the female labour force (FTP_{it}) increases by 1, then the unemployment gender gap will decrease by 2.340%, keeping all other factors constant. As an example, it could be that in the female labour force where 20% are primary educated, 20% are tertiary educated, and so if the tertiary educated rises to 40% or the primary educated decreases to 10%, then the ratio will increase by 1. It could also be that less females are primary educated and more are tertiary educated, which could also make the ratio increase by 1. Indeed, taking Spain as a case in point, in order to give some intuitive explanations, from 2003 to 2004, the percentage of tertiary educated females in the female labour force increased from 33.7% to 35.1%, and the percentage of primary educated females in the female labour force declined from 44.4% to 42.1%. This caused the variable FTP_{it} to jump from 0.759 (33.7%/44.4%) to 0.833 (35.1%/42.1%). In this case, the FTP_{it} 's education effect on Spain's unemployment gender gap from 2003 to 2004 would be (0.833-0.759)×(-2.340%) = -0.173%. This shows that the size of FTP_{it}'s effect on unemployment gender gaps is -0.173%, while the actual change of gender gap in Spain from 2003 to 2004 is -0.886%. The evidence indicates that education is one of the main determinants of unemployment gender gaps. As the relative proportion of tertiary educated females compared to primary educated females (FTP_{it}) in Spain has been increasing over the

last two decades, the cumulative education effect over these years would be quite large. In Table 3.1 and Table 3.2, the signs of female and male education variable coefficients are generally as to be expected. Positive coefficients for male secondary/primary education (MSP_{it}) mean that more males with secondary education relative to those with primary education would help to reduce male unemployment rate, consequently increasing the gender gap. Similarly, negative signs for FTP_{it} and FSP_{it} indicate that more females with tertiary and secondary education (less with primary education) in the labour force will narrow the gender gap of the unemployment rate.

Comparing the column (1) results from Table 3.1 and 3.2, it is notable that the coefficients for secondary education (both females FSP_{it} and males MSP_{it}) are all significant, while coefficients for tertiary education are not (only significant for FTP_{it}). It seems that the gender gaps are largely explained by secondary variables. However, the data show less variation for FTP_{it} over time, which could also lead to insignificant coefficients.

Further estimations are applied with sub-samples: before 2008 and after 2008. The year 2008 has been chosen to split the whole sample into two periods, namely before the recent crisis and after the crisis began. The purpose is to establish whether the effect of economic status on the gender unemployment gap differs as a result of the recession. From columns (1), (2), and (3) in both tables, it is obvious that, generally

speaking, the coefficient of the variable GDP_{it} is not significant throughout the 17 years, but the relation between GDP_{it} and unemployment gender gap (GAP_{it}) only becomes clear after 2008.

Moreover, the GDP_{it} coefficient magnitude is relatively robust, with different education variables. For example, the 0.204 in column (3) of Table 3.1 means that, if real GDP per capita in the year divided by real GDP per capita in 2005 increases by 1, i.e. real GDP per capita doubles, then the unemployment rate gender gap would increase by 0.204%, keeping others constant. Again, taking Spain during the recession as an example, real GDP per capita in 2005, 2008, and 2009 is \$27392, \$28353, and \$27082 respectively (measuring in constant 2003 international \$, from the World Bank). As such, the GDP index can be calculated as: $GDP_{Spain,2008} = \frac{\$28353}{\$27392} \times 100 = 103.508$; and $GDP_{Spain,2009} = \frac{\$27082}{\$27392} \times = 98.868$. The GDP effect on unemployment gender gap in Spain is therefore: $(98.868 - 103.508) \times 0.204\% = -0.946\%$, while the actual change of unemployment gender gap is $0.667\% - 2.963\% = -2.296\%$ (from Figure 1 in the Introduction chapter). This shows that the nearly -1% GDP effect during this recession period is able to explain almost 50% of the actual gender gap change in Spain.

This variable is a proxy of economy status, and so the gender unemployment gap is larger when the economy is good. The recession, which is characterised by significant

drops in real GDP per capita, has substantially affected the gender gaps. Consequently, for those countries with positive but declining unemployment gender gaps, the gaps further narrowed because of the recession. For those with zero or negative gaps, the recent crisis has made these gaps more negative. This evidence is also supported by previous research in the United States (Sahin, Song and Hobijn, 2010; Albanesi and Sahin, 2013). On the other hand, education variable coefficients become insignificant after 2008, which might indicate that unemployment gender gaps are mainly explained by real GDP per capita since the beginning of the crisis. With this said however, the smaller sample size could also be a reason, as the sample size drops from 220 observations for the whole sample to 52 observations after 2008.

Table 3.1 – Unemployment gender gap and tertiary education

	(1) All sample	(2) Before 2008	(3) After 2008
Female tertiary/primary	-2.340**	-0.463	-1.360*
	(1.101)	(0.697)	(0.940)
Male tertiary/primary	0.855	0.193	-0.972
	(1.129)	(1.059)	(1.095)
Real GDP per capita index	-0.004	-0.037	0.219***
	(0.049)	(0.042)	(0.049)
No. of observations	220	168	52
R^2	0.1281	0.0005	0.6101

Note: ***, **, and * mean that the coefficient is statistically significant at 1%, 5%, and 10% significance level respectively. Robust standard errors are reported in the parentheses.

Table 3.2 – Unemployment gender gap and secondary education

	(1) All sample	(2) Before 2008	(3) After 2008
Female secondary/primary	-2.115***	-1.759**	-2.594**
	(0.799)	(0.697)	(1.276)
Male secondary/primary	1.496**	1.628**	0.869
	(0.656)	(0.799)	(1.026)
Real GDP per capita index	-0.050	-0.041	0.256***
	(0.037)	(0.033)	(0.066)
No. of observations	220	168	52
R^2	0.0337	0.0181	0.4966

Note: ***, **, and * mean that the coefficient is statistically significant at 1%, 5%, and 10% significance level respectively. Robust standard errors are reported in the parentheses.

3.4 Determinants of male and female unemployment rates separately

As the unemployment rate gender gap is defined by the female unemployment rate minus male unemployment rate, in order to further investigate the determinants of the gender gaps I will estimate the determinants of male and female unemployment rate separately. However, as discussed above, the coefficients estimated in Equation 3.1 and Equation 3.2 only represent the averaged education and GDP effects, assuming that they are constant over time and across countries. From the results in Table 3.1 and 3.2, particularly before and after the recent crisis, one guess is that variables may have different effects over time. For the education variables in particular, the time length is 17 years (1995 to 2011), and thus the effects might largely depend on labour market equilibrium and policies. In addition, education might play different roles across countries. To capture these different education effects over time and across countries, female and male unemployment rates are to be estimated separately with interactions between education variables and time and country dummy variables. The four equations are:

$$Female_{it} = \alpha_0 + \alpha_1 FTP_{it} + \alpha_2 GDP_{it} + \sum_{i=2}^{13} \beta_i \cdot Country_i + \sum_{t=2}^{17} \gamma_t \cdot Year_t + \sum_{i=2}^{13} \lambda_i \cdot Country_i \cdot FTP_{it} + \sum_{t=2}^{17} \eta_t \cdot Year_t \cdot FTP_{it} + \varepsilon_{it}$$

(3.3)

$$Female_{it} = \alpha_0 + \alpha_1 FSP_{it} + \alpha_1 GDP_{it} + \sum_{i=2}^{13} \beta_i \cdot Country_i + \sum_{t=2}^{17} \gamma_t \cdot Year_t + \sum_{i=2}^{13} \lambda_i \cdot Country_i \cdot FSP_{it} + \sum_{t=2}^{17} \eta_t \cdot Year_t \cdot FSP_{it} + \varepsilon_{it}$$

(3.4)

$$Male_{it} = \alpha_0 + \alpha_1 MTP_{it} + \alpha_1 GDP_{it} + \sum_{i=2}^{13} \beta_i \cdot Country_i + \sum_{t=2}^{17} \gamma_t \cdot Year_t + \sum_{i=2}^{13} \lambda_i \cdot Country_i \cdot MTP_{it} + \sum_{t=2}^{17} \eta_t \cdot Year_t \cdot MTP_{it} + \varepsilon_{it}$$

(3.5)

$$Male_{it} = \alpha_0 + \alpha_1 MSP_{it} + \alpha_1 GDP_{it} + \sum_{i=2}^{13} \beta_i \cdot Country_i + \sum_{t=2}^{17} \gamma_t \cdot Year_t + \sum_{i=2}^{13} \lambda_i \cdot Country_i \cdot MSP_{it} + \sum_{t=2}^{17} \eta_t \cdot Year_t \cdot MSP_{it} + \varepsilon_{it}$$

(3.6)

The main difference between the four equations is that each estimation focusses on the effect of different education variables (tertiary/primary or secondary/primary) on the male and female unemployment rate respectively. In order to measure different educational effects across countries and over time, I have employed a form of fixed effect panel model in which both intercepts and slopes might vary according to country and time. The model specifies $i-1$ country dummy variables, $t-1$ time

dummy variables, the variables under consideration (education variables and economic status variables), and the interactions between them. It therefore includes dummy variables to verify the unemployment rate level effect, while interactions are checked accordingly for the education variable growth effect. In the equations above, the UK ($i = 1$) and 1995 ($t = 1$) are taken as the omitted cases. The UK is chosen because it has had a close to zero gender unemployment gap for quite a long time.

Thus, the coefficients for the country dummy variables are the average unemployment levels for different countries, while the coefficients for interactions between country dummies and education variables represent the different education effects across countries. Similarly, the coefficients for year dummy variables are the average unemployment rate level in different periods, the coefficients for interactions between year dummies and education variables, all of which reveal the education effect in a different period, assuming that the effects are the same across countries. More detailed interpretations are shown below. The above four equations are estimated with OLS, while the results can be found in Table 3.3 and 3.4.

Table 3.3 shows the results for female unemployment, as in Equation 3.3 (the first column) and Equation 3.4 (the second column). In each column are the coefficients of education variables, economic status variables, country variables, the interaction terms of education and country variables, year dummy variables, and interactions of education and year variables.

I will now start with the first part of Table 3.3. Again, the coefficients of the country dummy variables represent the overall and approximate female unemployment level in that country compared to the UK, without the effect of education and time. It is clear that some countries' female unemployment rates are much higher than those of the UK, notably Spain, Italy, France, and Germany. In addition, some countries' overall female unemployment rates are lower than or close to those of the UK, notably Austria, Ireland, Norway, and Denmark. This evidence is consistent with the stylised facts highlighted in the introduction section. Additionally, the signs of GDP index coefficients are negative and significant, which is consistent with Table 3.1 and Table 3.2, as well as with expectations.

Looking at the second part of Table 3.3, we can observe that the coefficients for the interactions $Country_i \cdot FTP_{it}$ and $Country_i \cdot FSP_{it}$ indicate the specific education variable's growth effect for country i compared to the UK, assuming that these growth effects are constant over time. Since the UK is the omitted case, the coefficients for FTP and FSP constitute the education effect for the UK. Coefficient 3.070 for FTP indicates that, if the female labour force, the ratio of tertiary educated percentage and the primary educated percentage increase by 1, then the UK's aggregate female unemployment rate will rise by 3.070%. More tertiary educated females would increase the UK's unemployment rate, although this evidence is counter intuitive.

The education growth effect for other countries can be obtained by adding the UK's effect to the $Country_i \cdot FTP_{it}$'s coefficient, i.e. $\alpha_1 + \lambda_i$. Results show substantial variation across countries. The ratio of tertiary educated females compared to primary educated females (FTP_{it}) seems to have had an extremely significant effect on reducing the female unemployment rate in Spain and Italy. By computing $\alpha_1 + \lambda_i$ for these two countries, the FTP_{it} coefficient for Spain is -25.924, and the coefficient for Italy is roughly -30.786; both are negative and significant. The education variable has a moderate and negative effect on female unemployment rates in France, Germany, the Netherlands, and Portugal. However, in Austria, Belgium, Finland, Ireland, Norway, and Sweden, FTP_{it} seems to have no effect or even an adverse effect on the female unemployment rate.

At the same time, it is obvious that only the estimated education effect itself ($Country_i \cdot FTP_{it}$'s coefficient, i.e. $\alpha_1 + \lambda_i$) would not indicate the significant effect that education has had on reducing the female unemployment rate of Spain. Indeed, it should be the coefficient and the education variable FTP_{it} that affect the outcome. However, it is true that in Mediterranean countries particularly, the proportion of women getting tertiary and secondary qualifications has been increasing during the past two decades, while the proportion of primary educated women has been declining. Such evidences are also shown in Appendix Figure A1.1 to Figure A13.2, and discussed in the above section. Thus, the variables FTP_{it} and FSP_{it} for these countries have been increasing generally across the sampling period. From this

it seems clear that education variables have a substantial impact on reducing female unemployment rates in these countries.

This evidence tells a similar story to that of the results revealed by Azmat, Güell and Manning (2006) in the late 1990s; indeed, they found that unemployment gender gaps are larger in countries with a lower female labour market attachment. In their paper, labour market attachment refers to human capital or education. A higher level of education makes people more likely to stay in and join the labour force, and less likely to leave the labour force, thus implying higher labour force attachment, as defined in the 1.1 Background section. As female labour market attachment gradually improves, the gaps become smaller. In using the more recent aggregate data (1995 to 2011), the analysis provided by this chapter still finds that more female labour market attachments (higher education level) would reduce female unemployment rates by more, but only in countries with lower labour market attachments and higher unemployment gender gaps (Mediterranean countries).

Unlike the Mediterranean countries, northern European countries with high female labour market attachment, like Norway and Sweden, would not produce a great female education effect, as the results in Table 3.3 show generally insignificant female education effect for FTP_{it}. The lower variation in education variables across these countries could also lead to such an insignificant education effect.

The second column of Table 3.3 shows the estimation results for Equation 3.4. First of all, unlike the FTP_{it} above, the ratio of female secondary educated percentage to primary educated percentage (FSP_{it}) does not seem to explain the UK's female unemployment rate (α_1 here is insignificant). Again, the specific education effect of other countries is $\alpha_1 + \lambda_i$. Similar to the above, the incidence of more secondary educated females in the labour force has had a stronger effect on Spain, Italy, France and Portugal's female unemployment rates. At the same time, this education variable has had either an adverse or no effect in countries such as Austria, Finland, Germany, Ireland, Norway, and Sweden, which is also similar to column 1.

The coefficients for year and education interaction (year× FTP_{it}) represent generally, and across all the countries, the time-specific effect on unemployment rates relative to 1995. The average education effect for a specific year is calculated as $\alpha_1 + \eta_i$. That is to say, in the first column, the corresponding effect for each year is $3.070 + \eta_i$. For example, compared to the 3.070 effect in 1995, the FTP_{it}'s effect on female unemployment rates in 1999 is approximately 0.893. It was therefore relatively stable until 2008 and when the economic crisis hit these EU countries, the time specific effect turned negative. Again, the FTP_{it}'s coefficient essentially asks, as the education distribution changes (more tertiary education women compared to primary educated), how much will the female unemployment rate change? Thus, since 2008, female education variables have had a generally positive effect on reducing the female unemployment rate across all countries. Similar evidence is also presented in column

2.

Generally speaking, and unlike the country specific effect outlined above, where there is significant variation across countries, the time specific effects show the following trend: women's average education level has played a more important role in reducing the female unemployment rate, and has thus reduced gender unemployment gaps.

Table 3.4 shows the result for Equation 3.5 and Equation 3.6. First of all, the variables MTP and MSP do not seem to explain the male unemployment rate in the UK, as the coefficients appear insignificant. In this estimation, the variable GDP is negative and significant, as also indicated in Table 3.3.

As for countries other than the UK, the education variable's effects also show huge variation across countries (like Table 3.3 for female unemployment rate). In France, Italy, Portugal, and Spain, both MTP and MSP have had a significant and negative effect on male unemployment rate. On the other hand, similar to Table 3.3, the increasing number of tertiary or secondary educated people does not appear to have decreased but instead to have increased the unemployment rate in certain countries such as Sweden and Austria. However, there are some extremely large coefficients in both Table 3.3 and Table 3.4; hence, it is quite difficult to interpret the corresponding education effect on male or female unemployment rate, particularly when comparing precisely different effects across countries. Thus, in this paper, one that does not

present a further investigation, understanding the signs or directions of the main variable is more important than knowing the magnitude of the variable's effect.

As for the education effect over time, the effects of MTP and MSP are only significant after 2008, constituting a different pattern in comparison with Table 3.3. That is to say, while females are becoming increasingly attached to the labour market and contributing to the production of smaller gender unemployment gaps, the status of male workers has not changed significantly for a very long period. Therefore, in view of the results for both genders, it is clear that the narrowing of aggregate unemployment gender gaps is largely due to the increasing female education effect and increasing female labour market attachment over the sample period.

In addition, by comparing the GDP coefficient in Table 3.3 and Table 3.4, it is notable that both male and female unemployment rates are negatively determined by GDP. However, this variable's coefficient is more negative for males (-0.418 and -0.312 in Table 3.3 for females, and -0.526and -0.502 in Table 3.4 for males respectively). By comparing the magnitude of the GDP coefficient, we can conclude that male unemployment rates are related more to economic status than to the female unemployment rate, although whether the two coefficients are statistically different should be further tested.

These results are similar to the conclusion reached by Sahin, Song and Hobijn (2010)

regarding the US labour market, namely that the recent recession has had a more adverse effect on men than women. I can then conclude that male workers are more concentrated in the sectors (goods/industry sector) that were hit hardest by the recession, which is also discussed in Section 1.1. The fraction of the employment decline in the goods sector therefore seems to be permanent and is likely to produce a significant structural change, just as it did after the 2001 recession.

Table 3.3: Female unemployment rate-Equation 3.3 and Equation 3.4

Equation 3.3		Equation 3.4	
FTP	3.070***	FSP	-0.031
Real GDP per capital index	-0.418***	Real GDP per capital index	-0.312***
Austria	2.402**	Austria	-4.045***
Belgium	10.377***	Belgium	15.373***
Finland	5.903***	Finland	8.554***
France	18.556***	France	29.333***
Germany	13.981***	Germany	5.442**
Ireland	-3.962***	Ireland	-1.953
Italy	24.619***	Italy	32.028***
Netherlands	6.578***	Netherlands	16.347***
Norway	-6.931***	Norway	-6.849***
Portugal	7.317***	Portugal	7.611***
Spain	36.771***	Spain	40.738***
Sweden	-4.726***	Sweden	2.610
Austria× FTP_{it}	-2.484	Austria× FSP_{it}	1.998***
Belgium× FTP_{it}	-3.201***	Belgium× FSP_{it}	-6.500***
Finland× FTP_{it}	-0.695	Finland× FSP_{it}	-1.367**
France× FTP_{it}	-11.107***	France× FSP_{it}	-15.472***
Germany× FTP_{it}	-6.780***	Germany× FSP_{it}	0.479
Ireland× FTP_{it}	1.774***	Ireland× FSP_{it}	1.076*
Italy× FTP_{it}	-33.856***	Italy× FSP_{it}	-18.321***
Netherlands× FTP_{it}	-5.429***	Netherlands× FSP_{it}	-9.711***
Norway× FTP_{it}	2.162**	Norway× FSP_{it}	1.808**
Portugal× FTP_{it}	-9.863	Portugal× FSP_{it}	-19.523*
Spain× FTP_{it}	-28.994***	Spain× FSP_{it}	-52.557***
Sweden× FTP_{it}	3.253***	Sweden× FSP_{it}	-0.048
1996	0.741	1996	0.951
1997	1.945***	1997	1.700
1998	3.151***	1998	1.578
1999	3.860***	1999	1.748

2000	4.949***	2000	2.426**
2001	4.585***	2001	1.115
2002	5.516***	2002	2.465**
2003	5.967***	2003	3.265**
2004	7.940***	2004	4.759***
2005	9.227***	2005	6.234***
2006	9.710***	2006	7.565***
2007	10.857***	2007	8.349***
2008	12.060***	2008	9.281***
2009	12.935***	2009	11.956***
2010	15.105***	2010	14.083***
2011	16.675***	2011	16.025***
1996× FTP_{it}	0.048	1996× FSP_{it}	0.032
1997× FTP_{it}	-0.645	1997× FSP_{it}	-0.124
1998× FTP_{it}	-1.699**	1998× FSP_{it}	-0.151
1999× FTP_{it}	-2.177***	1999× FSP_{it}	-0.190
2000× FTP_{it}	-2.544***	2000× FSP_{it}	-0.241
2001× FTP_{it}	-2.483***	2001× FSP_{it}	-0.109
2002× FTP_{it}	-2.514***	2002× FSP_{it}	-0.119
2003× FTP_{it}	-2.415***	2003× FSP_{it}	-0.233
2004× FTP_{it}	-2.766***	2004× FSP_{it}	-0.318
2005× FTP_{it}	-2.886***	2005× FSP_{it}	-0.420
2006× FTP_{it}	-2.229***	2006× FSP_{it}	-0.578
2007× FTP_{it}	-2.553***	2007× FSP_{it}	-0.731
2008× FTP_{it}	-3.507***	2008× FSP_{it}	-1.256**
2009× FTP_{it}	-4.327***	2009× FSP_{it}	-2.505***
2010× FTP_{it}	-4.675***	2010× FSP_{it}	-2.890***
2011× FTP_{it}	-5.081***	2011× FSP_{it}	-3.379***
R^2	0.1425	R^2	0.1134

Note: ***, **, and * mean that the coefficient is statistically significant at 1%, 5%, and 10% significance level respectively.

Table 3.4: Male unemployment rate-Equation 3.5 and Equation 3.6

Equation 3.5		Equation 3.6	
MTP	1.421	MSP	-0.388
Real GDP per capital index	-0.526***	Real GDP per capital index	-0.502***
Austria	-1.426	Austria	-16.046***
Belgium	4.990***	Belgium	6.519***
Finland	3.094**	Finland	3.611***
France	13.864***	France	26.238***
Germany	4.619*	Germany	4.064
Ireland	-8.320***	Ireland	-10.137***
Italy	22.195***	Italy	25.074***
Netherlands	1.205	Netherlands	1.693
Norway	-6.125***	Norway	-7.933***
Portugal	6.130**	Portugal	4.680**
Spain	9.789***	Spain	8.683***
Sweden	-3.900	Sweden	-1.704
Austria× MTP_{it}	0.657	Austria× MSP_{it}	4.209***
Belgium× MTP_{it}	-3.101**	Belgium× MSP_{it}	-3.924***
Finland× MTP_{it}	-0.259	Finland× MSP_{it}	-0.310
France× MTP_{it}	-12.058***	France× MSP_{it}	-14.264***
Germany× MTP_{it}	-0.118	Germany× MSP_{it}	0.590
Ireland× MTP_{it}	9.715***	Ireland× MSP_{it}	8.429***
Italy× MTP_{it}	-82.005***	Italy× MSP_{it}	-28.142**
Netherlands× MTP_{it}	-2.167	Netherlands× MSP_{it}	-1.965
Norway× MTP_{it}	1.738	Norway× MSP_{it}	1.859***
Portugal× MTP_{it}	-31.631*	Portugal× MSP_{it}	-21.958*
Spain× MTP_{it}	-8.687	Spain× MSP_{it}	-11.027
Sweden× MTP_{it}	4.126**	Sweden× MSP_{it}	1.229*
1996	0.778	1996	0.967
1997	1.836*	1997	2.193**
1998	2.412**	1998	1.844*
1999	3.698***	1999	2.477**

2000	4.705***	2000	3.460***
2001	4.910**	2001	3.415***
2002	5.888***	2002	4.736***
2003	6.544***	2003	6.076***
2004	8.057***	2004	7.290***
2005	9.320***	2005	8.500***
2006	9.767***	2006	9.194***
2007	11.150***	2007	10.181***
2008	12.650***	2008	11.241***
2009	15.095***	2009	14.036***
2010	17.097***	2010	15.821***
2011	19.498***	2011	17.051***
1996× MTP_{it}	0.455	1996× MTP_{it}	0.024
1997× MTP_{it}	0.341	1997× MTP_{it}	-0.119
1998× MTP_{it}	-0.114	1998× MTP_{it}	0.112
1999× MTP_{it}	-0.455	1999× MTP_{it}	0.232
2000× MTP_{it}	-0.599	2000× MTP_{it}	0.210
2001× MTP_{it}	-0.560	2001× MTP_{it}	0.244
2002× MTP_{it}	-0.313	2002× MTP_{it}	0.210
2003× MTP_{it}	-0.087	2003× MTP_{it}	-0.016
2004× MTP_{it}	-0.269	2004× MTP_{it}	0.085
2005× MTP_{it}	-0.404	2005× MTP_{it}	0.037
2006× MTP_{it}	0.354	2006× MTP_{it}	0.316
2007× MTP_{it}	0.156	2007× MTP_{it}	0.290
2008× MTP_{it}	-1.159**	2008× MTP_{it}	-0.262
2009× MTP_{it}	-3.586**	2009× MTP_{it}	-1.489**
2010× MTP_{it}	-4.026***	2010× MTP_{it}	-1.683***
2011× MTP_{it}	-5.354***	2011× MTP_{it}	-1.974***
R^2	0.1825	R^2	0.1792

Note: ***, **, and * mean that the coefficient is statistically significant at 1%, 5%, and 10% significance level respectively.

3.5 Conclusions

Amongst the European countries involved in this study, some countries have been shown to have positive but declining gender gaps in unemployment rates, such as Spain, Italy, and France, while other countries have had close to zero gaps for decades. The aim of this chapter is to study the impact of education and economics status on the gender unemployment gaps, as well as on male and female unemployment rates separately in the long run and over the business cycles. This will be achieved by using recent macro data taken from 13 European countries during the period spanning 1995-2011.

The education effects vary significantly across these EU countries for both females and males. The education effect for both genders turns out to be very influential in terms of reducing unemployment rate in countries with higher unemployment rates and higher unemployment gender gaps (Mediterranean countries). Indeed, this helps to explain the fact that, as female average education levels have improved over the last two decades in these countries, the female unemployment rate gradually decreases, and the unemployment gender gaps have become smaller. In addition, the time specific education effects show that females' average education level has played an increasingly important role in reducing the female unemployment rate. Indeed, this is compared to males' education effect, which demonstrated no significant trend over the same period. Therefore, all the results have proved that the closing of the

unemployment gender gap has been due to the convergence in labour market attachment of men and women, and largely due to the improvement of female labour market attachment.

The results also show that economic status plays a more important role especially during recession periods. When the economy is bad, male unemployment rates grow faster than female unemployment rates. Consequently, the unemployment gender gaps narrow or become negative. The explanation is that males are concentrated in goods-producing sectors that are always hit hardest by the crisis, which is consistent with the Table 2 and discussion in Section 1.1. At the same time, females mainly work in the service sectors and are more likely to keep their jobs during a recession.

4 Chapter 4

4.1 Introduction: the relationship between aggregate unemployment rates and transition rates

4.1.1 Introduction of Chapter 4

While Chapter 3 uses the macro data to try to establish the determinants of gender differences in unemployment rates, Chapter 4 attempts to understand the change of unemployment gender gaps in a deeper way. Since aggregate unemployment rates are generated by flows between labour market states, understanding the gender difference in labour market flow rates would therefore be helpful in understanding gender differences in aggregate unemployment rates. I will use the EU-SILC (Community Statistics on Income and Living Conditions) dataset with individual economic activity information to analyse the labour market transition rates by gender.

Section 4.1.2 explains the relationship between the aggregate unemployment rate and labour market transition rates, while Section 4.2 introduces the EU-SILC dataset. Following this, Section 4.3 shows the probit model to be used for estimation. Section 4.4.1 reports on the empirical results first. Since the results reveal some variation across countries, I interpret the results with reference to several groups of countries in

Section 4.4.2 and discuss the possible reasons for them. Finally, section 4.5 presents the conclusion.

4.1.2 The relationship between the aggregate unemployment rate and the labour market transition rates

As briefly discussed in the literature review, overall unemployment rate can be thought of as a rate that is generated by labour market transition rates between each of the three states: employment (E), unemployment (U), and non-participation (N). Azmat, Güell and Manning (2006) used the following relation between a steady-state unemployment rate and the labour market state:

$$u = (1-\alpha)\frac{h_{eu}}{h_{eu}+h_{ue}} + \alpha\frac{(h_{en}/h_{un})}{(h_{en}/h_{un})+(h_{ne}/h_{nu})}$$

(4.1)

where

$$\alpha = \frac{h_{ne}h_{un}+h_{nu}h_{en}}{h_{ne}(h_{un}+h_{eu}+h_{ue})+h_{iu}(h_{en}+h_{eu}+h_{ue})}$$

(4.2)

and $h_{s_i s_j}$ indicates the labour market transition from one state s_i to another state s_j (s_i , $s_j \in \{u = unemployment, e = employment, n = nonparticipation\}$, $s_i \neq s_j$).

Equation 4.1 implies that the unemployment rate can be written as a weighted average of two parts. According to Azmat, Güell and Manning (2006), the first part on the right-hand side of the equation is the unemployment rate with only flows between employment and unemployment, and without any flows into or out of non-participation. The second part is the unemployment rate if there were no direct flows between unemployment and employment (E→U), but only indirect flows via non-participation (E→N and N→U), as non-participation (or inactivity in some research) becomes increasingly important among females, and even males in some countries. α is the weight measuring the relative importance of flows via non-participation in generating unemployment.

This expression assumes steady state, however the analysis in this chapter deals with the recession period which, one could argue, is the 'between steady states' period. Thus, the aim of displaying Equation 4.1 is to get some ideas of the approximate relation between aggregate unemployment rate and labour market transitions. The equation will not be used directly in this chapter.

Generally speaking, according to such a relationship, if there are gender differences in unemployment rates, this must be because of gender differences in some (or all) of the

flow rates in Equation 4.1. Therefore, understanding the gender difference in labour market flow rates would be helpful in understanding gender differences in aggregate unemployment rates.

4.2 Data

The transition analysis uses the EU-SILC (Community Statistics on Income and Living Conditions) database. The EU-SILC database is a cross-sectional and longitudinal sample survey, coordinated by Eurostat and based on data from the EU member states; it provides data on income, poverty, social exclusion and living conditions in the European Union. The EU-SILC cross-sectional data pertain to fixed time periods, with variables on income, poverty, social exclusion and living conditions. Observed periodically, usually over four years, the longitudinal data pertain to individual-level changes over time.

EU-SILC is a multi-purpose instrument, which focusses mainly on income. Detailed data are collected on income components, primarily personal income, although a few household income components are also included. However, information on social exclusion, housing conditions, labour, education and health information is also obtained. Social exclusion and information on housing conditions is collected at household level. Income at a detailed component level is collected at personal level,

with some components included in the 'Household' section. Labour, education and health observations only apply to persons aged 16 and over.

The reference population in EU-SILC includes all private households and their current members residing in the territory of the countries at the time of data collection. Persons living in collective households and in institutions are generally excluded from the target population. Some small parts of the national territory amount to no more than 2% of the national population and the national territories listed below may be excluded from EU-SILC. All household members are surveyed, but only those aged 16 and over are interviewed.

The initially collected dataset included micro data for 15 main EU countries in 2004. As an increasing number of countries joined the European Union, 31 countries were then included in the dataset in 2012. Unlike the UK LFS (Labour Force Survey), which asks about the labour force status a year ago, the EU-SILC dataset provides more detailed information about individuals' change of labour market states. Individuals are asked to report their labour force status for each month of the interview year. With such information, average flow rates can be calculated more accurately.

Additionally, EU-SILC includes datasets not just for the UK, but also every country in

the European Union. It is therefore easier to compare results across countries. The variables indicating each person's labour market status each month during the year are not included in the longitudinal dataset, but only in the cross-sectional dataset, and the cross-sectional data has more information about personal details. In light of this, I have chosen to use the cross-sectional data in this chapter rather than the longitudinal data.

In order to compare the results with the macro data in the previous chapter while simultaneously keeping a sufficient time range for each country, the micro data for nine main European countries from 2004 to 2012 is used for the regressions[2]. These countries include Austria, Belgium, France, Germany, Italy, Spain, the Netherlands, Portugal and the UK.

In the next section, which deals with probit analysis, I use the micro data of individuals aged 15-64 not currently in full-time education. In the EU-SILC cross-sectional data for each year, individuals are asked to report their main economic activity for every month of the year, which is the original source of their labour market status (employment, unemployment, and non-participation). From 2004 to 2008, the following economic activities were classified as employment status (E): employee (full-time), employee (part-time), self-employed (full-time) and

[2] Some countries (like Finland, Sweden, and Norway) are not included because of missing data for many years. Not all of the countries have full micro data from 2004 to 2012, which will be discussed later in Section 4.3.

self-employed (part-time). Meanwhile, the activity 'unemployed' is classified as unemployment (U), and the activity 'other inactive' is classified as non-participation (N). Being that more categories' economic activities are added in, from 2009 the non-participation (N) status includes both 'domestic tasks and care responsibilities' and 'other inactive'. However, in 2009, when the new category was introduced, some transition rates oddly jumped. Within the appendix, Figure B1.1 through to Figure B9.2 show graphs of the six transition rates by time for each country and for both genders. In most of the figures, there are obvious and odd jumps in the transition rate h_{ne} around the year 2009. Meanwhile, other transition rates exhibit a relatively stable figure by time compared to h_{ne}. Therefore, these odd jumps in h_{ne} may cause more sampling noises in estimations involving non-participation, which does happen in the empirical results section.

Being that the data tries to include as many EU countries as possible, another notable fact about the EU-SILC dataset is that the observations are not quite sufficient for each country in each year, particularly in view of the fact that they are conditional on certain initial labour market transitions. In the last row of Table 4.1 through to Table 4.9, we can see the number of observations of the corresponding probit model. Indeed, this is the number of observations with the corresponding initial labour market states throughout the sample years. Thus, the number of observations for each year varies from several thousand to only several hundred (such as the U→E transition in

Belgium). Therefore, transition rates in some years may take zero values calculated from the dataset, which will be shown in Section 4.4. Moreover, this shortage of observations might also lead to the issue of sampling noises.

In the probit model from the following section and in the transition rate calculations, I use the second quarter transition to represent transitions in each year. First, it is reasonable to assume that people would change their labour market status once at most during a three-month period. Second, unlike the individual's economic activities, other individual characteristics are surveyed once a year, and so it is reasonable to select just one quarter to represent transition for the whole year. Moreover, being that the dataset is not seasonally adjusted, picking up the second quarter would rule out the possible seasonal effect on individuals' labour market movements, especially their effect in winter (festival effect) and summer (tourist effect). In Appendix Table B.2, I have included the summary statistics for the number of each labour market transitions and female dummy variable used in Chapter 4. Only statistics for Spain is provided in order to keep the thesis in manageable length.

4.3 Probit models

The gender effects on labour market transitions are calculated using the following probit models. The results will be used to try to answer two basic questions; the first asks whether there is a difference between the likelihood of females and males to transit from one labour market state to another; second, and more importantly, is whether this likelihood has changed during the recent recession. The following probit model will be estimated for each country separately:

$$P(S_1 = s_i | S_0 = s_j) = \Phi(\beta_0 + \beta_1 \cdot female + \sum_{t=2} \beta_t \cdot d_t \cdot female + \sum_{t=2} \gamma_t \cdot d_t)$$

where

$s_i,\ s_j \in \{u = unemployment, e = employment, n = nonparticipation\},\ s_i \neq s_j$

$d =$ year dummy variable with available database

$t =$ number of years of database available

In addition, S_0 stands for the individual's labour market state at the beginning of the 3-month period (the second quarter), and S_1 is his/her state at the end of the period. Therefore, the left hand side shows the probability of movement between unemployment, employment and non-participation. To capture both the female effect and the time effect on these movements, the female dummy variable, year dummy variable and interactions of female and year variables are all used as explanatory

variables on the right hand side. Indeed, with all these variables, the marginal effect of the female dummy variable can be obtained using Stata. The interpretation and presentation of the marginal effect result will be discussed in the next section.

As discussed in the data section, the number of observations in each country within each year is insufficient. As a result, when more detailed variables are included, such as education and industry variables, there appear to be too many insignificant results. Unfortunately, in this case I must give up testing the relationship between labour market transition rates and more detailed personal characteristics.

I have chosen the separate probit model for each transition pair rather than a single multinomial logit or probit model for each initial state. The reason for this is twofold; first, the marginal effects of the main determinant variables are easier to obtain, interpret and compare across the countries. Second, in estimating the transition separately I can provide a clearer link with Equation 4.1.

However, not all of the countries have full micro data from 2004 to 2012. Amongst the nine countries involved, Austria, Italy, Spain and Portugal have full data from 2004 to 2012, while the Netherlands and the UK lack data for 2004, and Belgium lacks data for 2012. France has data from 2004 to 2010, while Germany only has data for 2005 and from 2008 to 2012. Therefore, $d_2 \dots d_t$ in the probit model are the year dummy variables of the dataset available since the second year, as the first year is the

omitted year dummy variable, and t is the number of years of database availability.

The number of interactions also depends on data availability. For instance, for countries with full nine-year data from 2004 to 2012, d_2 is the dummy variable for the year 2005 and $t = 9$. If Germany only has data for 2005, 2008, 2009, 2010, 2011 and 2012, then d_2 is the dummy variable for the year 2008, and $t = 6$.

4.4 Empirical results

4.4.1 Result interpretation

The marginal effects obtained from the above probit models can be used to explain the average transition rate difference between females and males, keeping other conditions constant. Simply put, it is the change of transition rates if a male worker were a female, keeping other characteristics constant.

More specifically, immediately after the probit estimation of each country, I use the 'margins' command in Stata to compute the marginal effect of the variable $female$. In this case, even when both dummy term $\beta_1 \cdot female$ and the interaction term $\sum_{t=2} \beta_t \cdot d_t \cdot female$ are included on the right hand side of the probit model, the 'margins' command is able to capture the aggregate and average marginal effect of the variable $female$ from both terms, over the sampling period d_t[3].

The Stata results report the significance and signs of the female marginal effects, which could show the direction effect of the female dummy variable. The results also report the magnitude of female marginal effects, which is the difference between average male and female transition rate, or the increment of the transition rate for being a female. However, neither the significance nor the magnitude could show the relative importance of marginal effect compared to the existing male transition rates.

[3] The specific Stata command to run after the corresponding probit estimation is: margins, over(year) dydx(female), where 'year' stands for year dummy variable d_t.

As such, I use the ratio that is calculated as the female dummy variable's marginal effect (for transition from state i to state j) divided by the corresponding male transition rate[4] (for transition from state i to state j) of the same year for the same country: $\frac{female\ marginal\ effect}{male\ transition\ rate}$, in order to measure the percentage effect of female marginal effect relative to the male transition rate. In other words, the ratio (Female marginal effect/Male transition rate) entails the percentage change of the male's corresponding transition rate if the individual were a female, keeping other characteristics constant. This can be also written as the ratio: $\frac{female\ transition\ rate - male\ transition\ rate}{male\ transition\ rate}$.

For example, the female marginal effect of transition E→U for Spain in 2006 is 0.0210 and significant (from Stata), whereas the number could not show the relative importance of the marginal effect on the corresponding male transition rate (0.0133). By calculating the ratio: 0.0210/0.0133=1.5817, we can conclude that being a female could raise the E→U transition rate by 158.17%; in other words, the difference between the average female E→U transition rate and the average male E→U transition rate for Spain in 2006 is quite large, thus mean it is very likely the source of the unemployment rate gender gap. In light of this, the significance of the female marginal effect is to show whether the female dummy variable is statistically different from zero. At the same time, this ratio helps to show whether the female marginal effect is economically significant and important over the male transition rate.

[4] The corresponding male transition rate is calculated from the same dataset conditional on transition from state i to state j.

Therefore, in the empirical results shown later, both the significance and ratio will be reported and discussed.

The ratios of marginal effects for male transition rate by year for each country are presented in the following tables (4.1 to 4.9). If the marginal effect turns out to be statistically insignificant, then the corresponding ratio will be marked in red. In some cases, male transition rates are zero, and then the corresponding ratio would be reported as "no value". This is very common in calculating transition rates $E \to N$ and $N \to E$, since the rates are much smaller than movements between $E \to U$ and $U \to E$ within one period. In fact, the results of $N \to U$ and $U \to N$ are difficult to obtain due to the lack of transitions between unemployment and non-participation. In the Stata, sometimes even 15,000 iterations of the probit model would not converge and generate a result. Thus, the results of the $N \to U$ and $U \to N$ transition are not reported and discussed here. It is notable that the denominator male transition rate also changes over time, particularly during a crisis period. In order to measure the change of the female marginal effect with respect to a fixed rate, the ratios of marginal effect divided by male transition rate in 2004 ($\frac{female\ marginal\ effect}{male\ transition\ rate\ in\ 2004}$) are reported in the appendix from Table B.1 to Table B.9, where the original marginal effect results can be found in brackets under each ratio.

4.4.2 Discussion of results by country

The results from Table 4.1 to Table 4.9 show us three important facts: the significance of the marginal effect (insignificant if marked in red, with 10% significance level); the signs of marginal effects that could show the direction of the female dummy variable effect; and the magnitude of marginal effect on the overall male transition rate. Thus, the discussion will focus on these three factors.

The aim of this section is to present results for nine countries and to provide a proper discussion. Of particular note is the fact that these are the main countries in the European Union, and have similar historical and economic backgrounds. However, the empirical results turn out to vary substantially across countries. In essence, Spain, the UK and Belgium have shown a significance change in terms of the female marginal effect during the crisis period, while the other countries experienced little change during the recession. As such, this section will try to explain the heterogeneous results amongst the nine countries based on the results shown in Table 4.1 to Table 4.9 as well as recent research on EU countries with different labour market performance during a period of crisis. With this said however, not all of the countries have been provided with a proper explanation for their results, and further research is necessary in the future.

Before discussing the results by country, it should be noted that there are many “no

values" reported in the tables below, thus meaning that the corresponding male transition rates are zero. However, the "no value" cases mostly appear in and around 2009. As mentioned in the data section, 2009 was the year of the EU-SILC changes in the economic inactivity categories, which is why there are odd jumps in some of the transition rates around 2009 in Appendix Figure B1.1 through to Figure B9.2. Considering that other parts of the figures are quite normal and stable, the "no value" cases are seen to be useless. In light of this, I will focus more on the results without those of 2009 if "no value" cases occur.

Table 4.1: Spain -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2004	1.50787425	-0.303758057	4.277132308	-0.239280533
2005	1.193545142	-0.233372145	2.325241276	-0.550361625
2006	1.581668065	-0.168440456	2.189580117	-0.480691575
2007	1.34851665	-0.09413113	1.485822312	-0.726821021
2008	0.488507537	0.042103159	2.93371152	-0.4847531
2009	0.023345347	0.07307508	No value	No value
2010	-0.022470203	-0.016481544	3.739139371	-0.86028855
2011	0.383001261	-0.098304488	2.7668853	-0.892000467
2012	0.198701948	-0.067027409	1.559159343	-0.9213672
No. of Obs	118202	22473	110222	49389

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.2: The UK -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2005	-0.121668498	-0.107676	1.978440285	0.043028968
2006	-0.22136769	0.09038466	2.912371393	0.519064167
2007	-0.174811264	0.146655455	0.910950208	0.4757658
2008	-0.472078869	0.333333257	3.866463891	0.073781853
2009	-0.699801461	-0.00298496	14.2259394	No value
2010	-0.431249	-0.0217216	4.8906	-0.5084512
2011	-0.36712	-0.240484655	3.574155	-0.139419733
2012	-0.297627256	-0.420651978	3.038615542	-0.431971131
No. of obs	109394	64772	109394	10051

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.3: Belgium -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2004	0.212446218	-0.603301892	0.77825605	-0.695205333
2005	1.532327733	-0.253697371	0.1395615	-0.8408736
2006	0.850698333	0.002015956	6.660726429	-0.59864805
2007	1.21578585	-0.191149273	0.561124938	-0.277318843
2008	0.95357017	-0.47911185	1.872885733	-0.679526389
2009	-0.219840225	0.850071194	2.495276	No value
2010	0.1792296	0.245740737	1.302297057	-0.2547774
2011	0.457757431	-0.337339366	3.1803413	-0.6913359
No. of obs	42146	6759	42146	10074

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.4: Germany -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2005	0.069548109	0.130877895	0.504879839	-0.162339464
2008	0.046406327	-0.203121561	-0.133965855	-0.120835398
2009	4.047746127	2.5299645	No value	1.174708731
2010	-0.445685973	-0.3043225	No value	-0.461839286
2011	0.069548109	0.130877895	0.504879839	-0.162339464
2012	0.046406327	-0.203121561	-0.133965855	-0.120835398
No. of obs	80075	8654	80075	13057

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.5: Austria -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2004	0.4876989	-0.242780488	12.5643687	-0.7092306
2005	2.2889748	-0.321371484	4.94360208	-0.810649157
2006	0.616533957	-0.005882194	11.5012282	-0.60203975
2007	0.446756127	0.081206408	10.30755764	-0.66640896
2008	0.788601509	0.069259832	5.558193333	-0.64549888
2009	0.432033368	-0.169658036	5.1330636	No value
2010	0.281467063	-0.470020308	3.600169067	-0.917868577
2011	0.237610455	-0.323968943	4.483272	-0.904891167
2012	0.188720368	0.017146216	3.234821625	-0.82712278
No. of obs	51477	3531	51477	8941

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.6: The Netherlands -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2005	1.12229325	-0.339572006	0.509184	-0.581242971
2006	0.706618091	-0.230414455	1.484622063	-0.76683357
2007	0.0649885	-0.159052622	1.083663261	-0.734320982
2008	0.911837714	-0.046332	1.830987467	-0.441624118
2009	0.5419872	-0.00714012	No value	No value
2010	-0.1251222	-0.092814792	2.116770675	-0.83347992
2011	-0.356778837	-0.394160075	No value	No value
2012	0.645628075	-0.492063238	No value	No value
No. of obs	43813	2676	43813	4964

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.7: France -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2004	-0.044790565	-0.366933223	2.365350291	1.1395212
2005	-0.141330617	-1.288033515	2.8014144	-0.177184317
2006	-0.2757144	-3.86906913	7.423478125	-0.54016088
2007	-0.081925385	-1.001368924	2.2009068	0.3044622
2008	0.023938353	0.267292542	2.956022138	-0.2079822
2009	0.228290538	2.781398955	9.8409924	No value
2010	0.087693266	0.714414595	4.90173355	-0.59037264
No. of obs	68753	7199	68753	10851

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.8: Italy -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2004	0.838416325	-0.155856292	2.310832857	-0.684661694
2005	1.13681146	-0.031816155	2.301569113	-0.688405194
2006	0.85029362	-0.040107856	2.284047021	-0.743963931
2007	0.951154313	-0.051684085	2.820840091	-0.700462708
2008	0.907884878	-0.214535948	4.104177263	-0.51817275
2009	0.166077164	-0.049555411	No value	No value
2010	0.563831063	-0.11321397	1.883470958	-0.603543854
2011	0.739583395	0.010445694	1.546891833	-0.418004612
2012	0.446621604	-0.1219509	4.652490827	-0.769564667
No. of obs	171650	23488	171650	18908

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table 4.9: Portugal -- Marginal effect/male transition rate

	E→U	U→E	E→N	N→E
2005	0.044470769	-0.464920327	1.1581174	-0.87024185
2006	0.13618345	-1.267553963	0.3961272	-0.288150545
2007	0.464305436	-0.909888388	1.07167438	-0.145257327
2008	0.2679387	-1.001400517	1.988929375	-0.46166315
2009	-0.020519516	-0.028077755	No value	No value
2010	-0.251586635	-0.770397064	2.662084	-1.94238
2011	0.120997129	-1.233504911	2.186356	-1.9013236
2012	0.324511495	-0.895496467	20.0768658	No value
No. of obs	109394	17759	102159	23853

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

4.4.2.1 Spain, the UK and Belgium

In this section, Spain, the UK, and Belgium (with results in Table 4.1, 4.2, and 4.3 respectively) will be discussed in turn. Starting with Spain and Table 4.1, in terms of signs, the female marginal effects on transition E→U are generally positive, showing that females are more likely to become unemployed from being in employment. This evidence is consistent with the facts in Spain. Similarly, the generally negative signs of the marginal effect on U→E transition are also as expected, as are those of E→N and N→E. Indeed, the signs show that women in Spain are more likely to leave employment for unemployment and non-participation than men. At the same time, it is more difficult for them to become employed from a state of unemployment and non-participation.

In terms of significance (with 10% as significance level), the female effect on transition between employment and unemployment (E→U) becomes insignificant in 2009, 2010, and 2012, rather than positive and significant before 2009, which is roughly the most serious period of the crisis. This result implies that due to the recession, male workers from male-dominated industries are losing jobs, leading to no significant gender difference in the transition rate; this result is also consistent with the conclusion drawn in Chapter 3, as well as the evidence shown in Table 2 from Introduction chapter. In the meantime, the marginal effects for transition U→E also

turn out to be significantly smaller since 2007. Therefore, the transition analysis for Spain gives a more detailed explanation than that provided in Chapter 3; put simply, it has caused the aggregate gender unemployment gaps to become smaller during the recession. Not only do the male workers lose their jobs faster than women (E→U marginal effect goes from significant to insignificant during the crisis), but it is also more difficult for the males to get jobs from a state of unemployment than for the females (U→E marginal effect goes from significant to insignificant). It is common to observe that the transition rates E→U and U→E for all countries are much larger than rates E→N and N→E; thus, the E→U and U→E rate fluctuations would be the main source of the aggregate fluctuations of unemployment rates.

On the other hand, the E→N and N→E rates are much smaller compared to E→U and N → E, and therefore play a less important role in determining aggregate unemployment rates, even when there are relatively substantial movements of these rates. More importantly, Table 4.1 shows no obvious change of E→N and N→E results by business cycle. Although the N→E gender marginal effect has changed from insignificant to significant since 2007, it may not actually cause the aggregate unemployment rate to change significantly, since the transitions are small. Therefore, the later discussion about other countries will focus on results pertaining to E→U and U→E.

In terms of the magnitude of the ratios, the female dummy variable seems to have had

a significant impact on all the four transitions. As I have discussed above, the ratio represents the percentage change of the male's corresponding transition rate if the worker were a female, keeping other characteristics constant. The female marginal effect generally changes (increases or decreases) the corresponding male transition rate by 23.3% to almost 427.7% (for those significant results), thus signifying a substantial change in the male transition if the male worker becomes a woman. At the same time, it is not surprising that the ratios vary significantly from -23.3% to almost 427.7%[5], because the denominator male transition rates are quite different. Transition rates E→U and U→E, as the more important factor of fluctuations, are much larger than the E→N and N→E rates. Therefore, the ratios ($\frac{female\ marginal\ effect}{male\ transition\ rate}$) are usually larger for E→N and N→E. However, regardless of which transition we are looking for, the female marginal effects have an economically significant impact on the overall transition rate.

In summary, several conclusions can be drawn from the empirical results of Spain. First, the size of transition rates (E→U, U→E, E→N and N→E) varies, while E→U and U→E rates are much larger than the other two. As such, and according to Equation 4.1, E→U and U→E rates, as well as the corresponding female marginal effect, play a more important part in aggregate unemployment rate fluctuations. In other words, although the absolute values of the coefficients relating to E→N and N→E are larger than those of E→U, U→E, they have little impact on the gender gap.

[5] However, sampling noises could be one reason why these vary from 23.3% to 427.7%.

This is because the number of individuals who make the E→N and N→E transitions is too small. Second, the female dummy variable generally has a significant marginal effect on the transitions E→U and U→E before the crisis, although the impact disappears afterwards. In other words, this evidence can be interpreted to mean that women initially have a disadvantage in obtaining work from a position of unemployment, and are also more likely to lose their jobs than men. As the recession becomes worse, male workers from industry sectors, which are most frequently hit by the crisis, lose jobs faster than females. Thus, the gender difference starts to narrow and then even disappear, which finally leads to the narrowing of the aggregate unemployment gender gap in Spain. Third, and as can be seen from the magnitude of reported ratios, the female marginal effects also have an economically significant impact on the overall transition rate.

As shown in Table 4.3, Belgium has exhibited a similar business cycle pattern to Spain (both E→U and U→E), when ignoring E→N and N→E. In addition, Table 4.2 suggests that the UK's E→U results also appear similar to those of Spain. As such, the conclusion drawn is identical to that in Chapter 3. Although the UK has experienced a negative or close to zero aggregate gender unemployment gap for a long period, during the beginning of the last crisis period (from 2008 to 2010 in this case), female workers were more likely to have stayed in their work position, while more males were being made unemployed. Thus, this evidence contributes to the enhanced negativity of the aggregate gender differences in the UK.

However, the estimation thus far cannot directly indicate that the gender differences are driven by industry sectoral differences in men and women during the recession, as the industry variables have not yet been included in the estimation. However, as mentioned in the data section, due to the lack of observations for each country and for each year, there have been many cases of insignificant results when industry variables are included in the probit estimation. In light of this, and based on the employment by activity data from Table 2, I can only conclude that, during the recession, the empirical evidence for the above three country might be due to the high proportion of male workers in the industrial sectors, which were mostly affected during the recession. A larger dataset would be helpful to further investigate this hypothesis in the future.

4.4.2.2 Discussion of heterogeneous empirical results: Germany, Austria and the Netherlands

4.4.2.2.1 Germany, Austria and the Netherlands

This subsection will discuss results for Germany, Austria, and the Netherlands. The results for Germany would seem to be fairly different from those for Spain. Although the data are limited for Germany, having examined Table 4.4 I find that, before the

recession (year 2005), there is no gender difference for transition between employment and unemployment (both E→U and U→E), as the marginal effects are insignificant. However, compared to Spain, this pattern did not change considerably from 2008 until 2012, except for E→U in 2009 and U→E in 2011. Generally speaking, the marginal effects for all four transitions remained insignificant before and during the recession. The female dummy variable's marginal effects have not changed during the business cycle.

Such heterogeneous empirical results of the micro data across EU countries are consistent with the heterogeneous macro status during the recession amongst OECD countries. During the recession, some countries experienced large declines in GDP, as well as large declines in employment, such as the US and Spain. In contrast, other countries such as Germany have experienced large falls in output, but a relatively mild decrease in employment; at the same time, the increase in unemployment has been the lowest of all OECD countries. There are several explanations for Germany's mild response to the recession, which might also explain why the marginal effect of gender on labour transitions has not changed a great deal.

First of all, Brenke, Rinne and Zimmermann (2013) have labelled short-time work as the 'German answer' to the economic crisis. Germany has significantly helped to

cushion the job losses by extending subsidies for a temporary reduction in working hours. In addition, short-time work has helped German companies be well prepared for the future, when the demand for their goods will increase again. They were able to expand their production without time loss. As a result, although the loss in GDP was much larger in Germany than in France, the UK or the US, unemployment has only moved up marginally, with lower working hours per person; indeed, this is why other labour market performances (labour market transition by gender in this case) also appeared to be stable during the crisis (Rinne and Zimmermann, 2011).

In addition, Rinne and Zimmermann (2011) have proposed that the stable labour market and strong economic position before the crisis are important factors. Substantial labour market reforms helped put the German economy into a relatively strong position when the crisis started. While the long-term unemployment rate was able to be substantially reduced, skilled labour in the best-managed and successful companies, typically in the export sector, became increasingly scarce. Firms struck by the recession have a strong incentive to retain their skilled and qualified workers, particularly given the climate of an ageing population and expected future shortages of skilled labour. In addition, the strategy of hoarding labour and ensuring internal flexibility could only be sustained because both the labour market and individual companies were in a relatively strong position when the demand shock hit the country.

The cause of GDP downturns varies by country, which might also lead to cross-country differences in labour market outcomes. While the United States and Spain suffered a decline in domestic demand driven by the falling net wealth of the household sector, Germany experienced no housing bubble, and the output decline was mainly driven by the collapse of world trade (Burda and Hunt, 2011).

However, Germany is not the only country that has not responded significantly to the crisis, with the Netherlands having had a similar experience. According to Rinne and Zimmermann (2011), the Netherlands first experienced a transitory shock in external demand. The nature of the main shock was therefore similar to that in Germany. Secondly, the Netherlands also faces long-term shortages of skilled workers, which has created incentives for firms to retain their qualified workforce during the crisis.

Moreover, it is also the case that Dutch firms were in a relatively good position when the crisis hit the country, and the government created a new short-time work scheme during the crisis (Cahuc and Carcillo, 2011). These factors appear to be important when adopting and sustaining a strategy of labour hoarding during the Great Recession. The crisis also had a relatively modest impact on the Austrian labour market. Similar to Germany and the Netherlands, the crisis hit the country in the form

of a transitory external demand shock; thus, a short-time work scheme existed during the crisis. Additionally, Austria is also expected to face long-term shortages of skilled workers.

The comparison of the aforementioned countries suggests that Germany, the Netherlands and Austria showed similar labour market outcomes during the crisis due to some common features: firstly, the three countries had experienced a transitory external demand shock; secondly, they were expected to face long-term shortages of skilled workers; and lastly, they all applied short-time work during the crisis. Therefore, these facts also explain the results for Austria and the Netherlands (Table 4.5 and Table 4.6) namely that gender differences of transition rates (both E→U and U→E) were insignificant before the crisis, and mostly insignificant after the crisis (except for certain years). Countries like Spain and the UK all applied a short-time working arrangement during that period, although the other features might not apply at the same time. Indeed, this might partly cause heterogeneous results amongst EU countries.

4.4.2.2.2 France versus Spain

In this subsection, France and Spain will be discussed and compared. The results for France (Table 4.7) show similar patterns to Germany; that is, there is no significant

change of female marginal effect over time (except 2006). However, the reason for this seems to be different from Germany, Austria and the Netherlands. Bentolila et al. (2012) studied the labour market situation in France and Spain, two neighbouring countries with similar labour market institutions (employment protection legislation (EPL)), unemployment benefits, wage bargaining, etc.). However, the two economies acted differently when the crisis started. While the French unemployment rate only rose to approximately 10% during the slump, in Spain it surged to almost 23% by the end of 2011. Their research thus attempted to identify whether the two differences between the labour market regulations of these two economies can explain a large part of this very different response to the crisis. Indeed, there is a larger gap between the dismissal costs of workers with permanent and temporary contracts and much laxer regulation on the use of the latter in Spain than in France. Moreover, these differences, often ignored in cross-country comparisons of overall EPL, could explain up to 45% of the much greater rise in Spanish unemployment. As such, this explanation might also partly account for the stable female marginal effect in France over time.

4.4.2.2.3 Italy and Portugal

It is surprising to discover that Italy's results (displayed in Table 4.8) show a similar pattern to those of Germany, Austria and the Netherlands, where the significance of the female marginal effect did not change considerably before and after the crisis

began. However, Italy is actually among those countries to have experienced the largest increase in unemployment rate, as is also the case with Spain. On the other hand, compared to Spain, where the unemployment rate started to increase rapidly (in June 2007), the increase was relatively mild and delayed in Germany and Italy. Pissarides (2013) explained that the reason behind this is the excessive labour regulation and the high public spending of these two countries, which kept unemployment artificially low during the first stages of the recession. When the excessive debt levels excluded them from international lending markets and they had to embark on programmes of strict fiscal austerity, Italy started to experience a large rise in unemployment after 2009. However, the labour regulation and the high public spending might play a significant role in keeping the labour market state as before, and keeping the difference in male and female transition rates stable. It is also true that the inflows into unemployment were relatively small in Italy and Germany (Arpaia and Curci, 2010). Moreover, Arpaia and Curci (2010) showed the correlation (during 2008 Q2 to 2008 Q4) across sectors between total employment growth and share of men in the sector. This correlation was negative for Spain, which is consistent with the view that the shock stems mainly from harming industries where the share of men in disproportionately high, implying that employment growth is higher in industries where the share of men is high. However, the correlation was positive for Italy. Such heterogeneity also helps to explain the difference between Italy and Spain, although the underlying reason should be investigated further.

Similarly, Portugal (in Table 4.9) also shows no evidence of marginal effect significance change. Its labour market institutions (including EPL) and public spending are quite similar to those of Italy. Therefore, the same possible hypothesis can be presented for Portugal, although further research is necessary.

4.5 Conclusions

The aggregate unemployment rate can be generated by transition (flow) rates between labour market states: employment (E), unemployment (U), and non-participation (N). If there are gender differences in unemployment rates, this must be because of gender differences in some (or all) of the transition rates. Therefore, understanding the gender difference in labour market flow rates would be helpful in understanding gender differences in aggregate unemployment rates. At the same time, the EU-SILC (Community Statistics on Income and Living Conditions) dataset provides information on individuals' labour market activities, as well as their personal characteristics, for the nine main EU countries from 2004 to 2012 (according to data availability). Indeed, this gives enough of a time range to examine the underlying source of the unemployment gender gap's change during the recent economic recession.

The results turn out to vary across the countries. In Spain, Belgium and the UK, there are obviously significant difference before the crisis and during the crisis. During the recession, males have a higher probability of becoming unemployed than women, and women are more likely to get jobs out of unemployment relative to men. This evidence might be due to the high proportion of male workers in the industrial sector that was most significantly hit by the recession. Indeed, this caused the aggregate

male unemployment rate to increase faster than the female unemployment rate during this period.

However, in Germany, Austria and the Netherlands, there was no significant change in male and female transition rate difference. In other words, the differences between male and female labour market transition were relatively stable over the whole data period. Based on recent research, we can state that three features have contributed to this evidence: firstly, the three countries had experienced a transitory external demand shock; secondly, they were expected to face long-term shortages of skilled workers; lastly, they all applied short-time work during the crisis. Therefore, these countries' labour markets delivered only a mild response to the crisis. At the same time, France, Italy and Portugal showed similar results to Germany, Austria and the Netherlands. There are various possible explanations for these results, and thus there is a need for additional studies in the future.

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Appendix

Table A.1: Summary statistics for the variables in Chapter 3

		Gap	Male	Female	GDP	FTP	MTP	FSP	MSP
Austria	Mean	0.453	4.056	4.509	96.669	0.639	1.001	2.692	3.907
	Std	0.497	0.549	0.543	8.435	0.239	0.347	0.464	0.327
Belgium	Mean	2.238	7.149	9.387	95.862	1.677	1.004	1.591	1.285
	Std	1.578	0.754	1.723	6.992	0.451	0.249	0.315	0.267
Finland	Mean	0.281	9.525	9.807	92.956	1.937	1.197	2.347	2.071
	Std	1.273	2.476	2.606	11.821	0.821	0.351	0.534	0.433
France	Mean	2.299	8.789	11.089	96.304	1.03	0.835	1.463	1.595
	Std	1.273	1.345	2.306	5.727	0.318	0.215	0.222	0.176
Germany	Mean	0.192	8.627	8.819	99.544	1.174	1.753	3.339	3.65
	Std	0.941	1.364	1.447	6.732	0.244	0.161	0.382	0.306
Ireland	Mean	-1.82	8.566	6.746	87.461	1.765	0.764	1.881	1.027
	Std	2.696	4.788	3.103	14.305	0.787	0.301	0.414	0.314
Italy	Mean	4.834	7.378	12.213	96.879	0.472	0.237	1.316	0.824
	Std	2.011	1.345	3.143	4.042	0.19	0.063	0.285	0.161
Norway	Mean	-0.41	3.866	3.456	95.353	2.264	1.833	3.248	3.364
	Std	0.42	0.743	0.684	5.86	0.474	0.432	1.079	1.025
Portugal	Mean	1.876	6.592	8.468	97.093	0.239	0.127	0.226	0.178
	Std	0.607	2.573	2.406	6.389	0.073	0.037	0.063	0.044
Spain	Mean	7.388	12.128	19.516	93.559	0.773	0.468	0.53	0.366
	Std	4.513	5.154	6.554	8.711	0.19	0.119	0.118	0.091
Sweden	Mean	0.601	7.659	7.059	93.248	1.871	1.16	2.807	2.538
	Std	0.599	1.686	4.682	10.848	0.369	0.185	0.513	0.458
The Netherlands	Mean	1.128	3.853	4.981	97.151	0.978	0.943	1.595	1.463
	Std	0.973	1.081	1.617	8.277	0.247	0.186	0.153	0.094
The UK	Mean	-1.596	6.947	5.351	92.614	1.122	1.2	3.907	1.864
	Std	0.82	1.727	1.051	9.385	0.495	0.36	0.327	0.545

Note: the No. of observations for each variable are all 17, which is the No. of years.

Table A.2: Summary statistics for the labour market transitions and female variable in Spain

		2004	2005	2006	2007	2008	2009	2010	2011	2012
E→U	Male	160	131	103	104	117	234	248	138	174
	Female	209	183	176	169	193	244	190	152	163
U→E	Male	186	168	114	118	139	159	216	176	232
	Female	221	205	167	178	214	194	205	150	208
E→N	Male	17	17	18	25	15	0	7	5	7
	Female	47	36	38	43	43	15	26	15	14
N→E	Male	8	8	8	19	12	0	10	6	6
	Female	65	41	40	50	57	0	40	16	14
U→N	Male	0	0	3	2	0	0	0	0	2
	Female	4	4	3	4	5	1	2	4	1
N→U	Male	2	0	1	0	0	0	4	1	0
	Female	3	5	3	3	3	0	2	1	3
Female	Mean	0.531	0.52	0.521	0.522	0.522	0.522	0.521	0.523	0.52
	Std	0.499	0.499	0.499	0.5	0.5	0.5	0.5	0.499	0.5
	Obs	2848	2720	2523	2580	2701	2737	2732	2587	2514

Note: the sample includes individuals aged 15-64 not currently in full-time education from the second quarter of each year.

Table B.1: Spain -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2004	1.50787425 (0.0197754)	-0.303758057 (-0.0409486)	4.277132308 (0.006752)	-0.239280533 (-0.0035952)
2005	1.431731 (0.0187768)	-0.335450119 (-0.0452209)	3.007105269 (0.0047471)	-0.580271267 -0.0087186
2006	1.609279125 (0.0211053)	-0.195126902 (-0.0263044)	3.234391269 (0.0051059)	-0.468757433 (-0.0070431)
2007	1.35741775 (0.0178022)	-0.118896971 (-0.0160281)	2.9868345 (0.0047151)	-1.711555978 (-0.0257162)
2008	0.804124875 (0.0105459)	0.059551225 (0.0080279)	3.399914769 (0.0053672)	-0.688889933 (-0.0103506)
2009	0.051667 (0.0006776)	0.085420873 (0.0115153)	No value	No value
2010	-0.0570045 (-0.0007476)	-0.016515508 (-0.0022264)	2.224336846 (0.0035114)	-3.470120144 (-0.0521387)
2011	0.6010635 (0.0078828)	-0.07816307 (-0.0105369)	1.307021192 (0.0020633)	-1.894710211 (-0.0284681)
2012	0.416210625 (0.0054585)	-0.061686135 (-0.0083157)	1.091517577 (0.0017231)	-2.555087744 (-0.0383903)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.2: The UK -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2005	-0.121668498 (-0.0011401)	-0.107676 (-0.027916)	1.978440285 (0.0104786)	0.967291201 (0.0019141)
2006	-0.201525122 (-0.0018884)	0.064560471 (0.0167379)	1.641777288 (0.0086955)	11.66856247 (0.0131132)
2007	-0.108360839 (-0.0010154)	0.1188729 (0.0308189)	0.999038142 (0.0052913)	10.69521518 (0.0133166)
2008	-0.506256633 (-0.0047439)	0.249999943 (0.0648148)	2.069105738 (0.0109588)	1.658616054 (0.0032579)
2009	-0.62067902 (-0.0058161)	-0.002172343 (-0.0005632)	0.797259362 (0.0042226)	No value
2010	-0.354013602 (0.007524)	-0.014400257 (-0.0037334)	1.420589077 (0.007524)	-11.42998298 (-0.0476673)
2011	-0.301369913 (-0.002824)	-0.159428443 (-0.0413333)	1.038196858 (0.0054987)	-3.134155605 (-0.0130706)
2012	-0.280528007 (-0.0026287)	-0.303397071 (-0.0786585)	1.351240012 (0.0071567)	-9.71071102 (-0.0297123)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.3: Belgium -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2004	0.212446218 (0.0019108)	-0.603301892 (-0.0199059)	0.77825605 (0.0038181)	-0.695205333 (-0.014092)
2005	0.607008255 (0.0054596)	-0.190186831 (-0.0062752)	0.112617917 (0.0005525)	-1.316923733 (-0.0266944)
2006	0.873066345 (0.0078526)	0.001966969 (0.0000649)	3.2491441 (0.0159402)	-0.994387333 (-0.0201565)
2007	1.040795236 (0.0093612)	-0.247480492 (-0.0081656)	0.880661917 (0.0043205)	-0.329097733 (-0.0066709)
2008	0.689783118 (0.0062041)	-1.382930908 (-0.0456297)	1.490266267 (0.0073112)	-2.080756667 (-0.0421775)
2009	-0.2227083 (-0.0020031)	1.005957769 (0.0331915)	0.165512667 (0.000812)	-2.5130104 (-0.0509394)
2010	0.2729736 (0.0024552)	0.301082677 (0.0099342)	0.620835567 (0.0030458)	-0.2327596 (-0.0047181)
2011	0.474624064 (0.0042689)	-0.661819985 (-0.0218367)	0.930071117 (0.0045629)	-0.797798933 (-0.0161716)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.4: Germany -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2005	0.069548109 (0.0008538)	0.069727314 (0.0044006)	0.268474597 (0.0078087)	-0.125289231 (-0.0130041)
2008	0.046406327 (0.000856)	-0.2022808 (-0.0191818)	-0.154019527 (0.0060963)	-0.114566873 (-0.0074225)
2009	4.047746127 (0.0032959)	3.160100236 (-0.0146053)	0.201125091 (0.000388)	1.363659218 (-0.0413868)
2010	-0.445685973 (-0.0015381)	-0.254389318 (-0.0108641)	-1.418438509 (0.0026307)	-0.886395545 (-0.025863)
2011	0.069548109 (0.0000414)	0.069727314 (-0.0422838)	0.268474597 (0.0053751)	-0.125289231 (-0.050159)
2012	0.046406327 (0.0019847)	-0.2022808 (-0.0214608)	-0.154019527 (0.00457)	-0.114566873 (-0.1033249)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.5: Austria -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2004	0.4876989 (0.0027185)	-0.242780488 (-0.0466358)	12.5643687 (0.0140071)	-0.7092306 (-0.0525356)
2005	1.48636488 (0.0082852)	-0.429559738 (-0.0825143)	7.2958392 (0.0081336)	-0.94575735 (-0.0700561)
2006	0.90607764 (0.0050506)	-0.006160641 (-0.0011834)	9.0549459 (0.0100947)	-0.25007805 (-0.0185243)
2007	0.70832502 (0.0039483)	0.101304388 (0.0194596)	12.3806631 (0.0138023)	-0.6247584 (-0.0462784)
2008	1.01448906 (0.0056549)	0.076142797 (0.0146263)	9.75039 (0.01087)	-0.6807996 (-0.0504296)
2009	1.00429914 (0.0055981)	-0.158403547 (-0.0304278)	1.4915316 (0.0016628)	No value
2010	0.56790864 (0.0031656)	-0.632453797 (-0.1214883)	6.2262564 (0.0069412)	-3.92892525 (-0.2910315)
2011	0.4606095 (0.0025675)	-0.407096876 (-0.0781994)	7.900776 (0.008808)	-3.14126505 (-0.2326863)
2012	0.4196166 (0.002339)	0.018872365 (0.0036252)	7.5711285 (0.0084405)	-1.80099315 (-0.1334069)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.6: The Netherlands -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2005	1.12229325 (0.0033855)	-0.339572006 (-0.0403687)	0.509184 (0.002304)	-0.581242971 (-0.0423823)
2006	0.706618091 (0.0029838)	-0.230414455 (-0.015177)	1.484622063 (0.0045593)	-0.76683357 (-0.0370451)
2007	0.0649885 (0.0004406)	-0.159052622 (-0.0201616)	1.083663261 (0.0084489)	-0.734320982 (-0.1228418)
2008	0.911837714 (0.002174)	-0.046332 (-0.0049896)	1.830987467 (0.0074836)	-0.441624118 (-0.0341255)
2009	0.5419872 (0.0003936)	-0.00714012 (-0.0004577)	No value	No value
2010	-0.1251222 (-0.0008246)	-0.092814792 (-0.0110275)	2.116770675 (0.0058738)	-0.83347992 (-0.1322984)
2011	-0.356778837 (-0.0023513)	-0.394160075 (-0.0468309)	No value	No value
2012	0.645628075 (0.0037012)	-0.492063238 (-0.0645833)	No value	No value

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.7: France -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2004	0.231469621 (0.0028035)	-0.044790565 (-0.0044442)	2.365350291 (0.0050828)	1.1395212 (0.0041287)
2005	-0.026577518 (-0.0003219)	-0.204720153 (-0.0203127)	1.581491782 (0.0033984)	-1.0827204 (-0.0039229)
2006	0.295473634 (0.0035787)	-0.356252392 (-0.035348)	2.744482045 (0.0058975)	-5.6046768 (-0.0203068)
2007	0.216409853 (0.0026211)	-0.111622659 (-0.0110754)	1.953131182 (0.004197)	1.1835432 (0.0042882)
2008	-0.087287206 (-0.0010572)	0.03661998 (0.0036335)	2.107026936 (0.0045277)	-1.3196112 (-0.0047812)
2009	0.096732587 (0.0011716)	0.356927647 (0.035415)	0.870323073 (0.0018702)	-34.1072244 (-0.1235769)
2010	-0.145916269 (-0.0017673)	0.104252302 (0.0103441)	1.715749191 (0.0036869)	-6.9633696 (-0.0252296)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.8: Italy -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2004	0.838416325 (0.0056482)	-0.155856292 (-0.0171284)	2.310832857 (0.011975)	-0.684661694 (-0.0239825)
2005	1.181014831 (0.0079562)	-0.028508078 (-0.003133)	1.662622531 (0.0086159)	-0.643512048 (-0.0225411)
2006	0.99298644 (0.0066895)	-0.035676499 (-0.0039208)	2.110682891 (0.0109378)	-0.812572742 (-0.028463)
2007	0.883734923 (0.0059535)	-0.042904976 (-0.0047152)	1.60893788 (0.0083377)	-0.505189403 (-0.0176959)
2008	0.980933147 (0.0066083)	-0.18180656 (-0.0199803)	1.666906497 (0.0086381)	-0.290465565 (-0.0101745)
2009	0.192733925 (0.0012984)	-0.036889435 (-0.0040541)	0.571407697 (0.0029611)	No value
2010	0.910082945 (0.006131)	-0.107063165 (-0.0117661)	1.531016017 (0.0079339)	-0.66763829 (-0.0233862)
2011	1.193765789 (0.0080421)	0.00987819 (0.0010856)	1.257421126 (0.0065161)	-0.462395371 (-0.0161969)
2012	0.981630813 (0.006613)	-0.1232963 (-0.0135501)	0.981394794 (0.0050857)	-0.637833774 (-0.0223422)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Table B.9: Portugal -- Marginal effect/male transition rate in 2004 & Marginal effects in bracket

	E→U	U→E	E→N	N→E
2005	0.044470769 (0.000388)	-0.464920327 (-0.0583582)	1.1581174 (0.0038863)	-0.87024185 (-0.0470401)
2006	0.252772769 (0.0022054)	-0.764404057 (-0.0959503)	0.5177452 (0.0017374)	-0.3086244 (-0.0166824)
2007	0.500720231 (0.0043687)	-0.934412723 (-0.1172903)	1.2019532 (0.0040334)	-0.22270115 (-0.0120379)
2008	0.287008385 (0.0025041)	-1.028252887 (-0.1290694)	1.7725636 (0.0059482)	-0.4091386 (-0.0221156)
2009	-0.037777231 (-0.0003296)	-0.02587414 (-0.0032478)	No value	No value
2010	-0.385382769 (-0.0033624)	-0.612049523 (-0.0768263)	1.870993 (0.0062785)	-0.8166825 (-0.044145)
2011	0.185344538 (0.0016171)	-0.979970107 (-0.1230088)	1.536637 (0.0051565)	-0.79942015 (-0.0432119)
2012	0.683256692 (0.0059613)	-0.591492337 (-0.0742459)	1.9982986 (0.0067057)	-0.84463415 (-0.0456559)

Note: ratios with insignificant marginal effect are marked in red. Significance level: 10%.

Figure A1.1 to Figure A13.2: Percentages of each education level in the male and female labor force

Figure A1.1 Austria: Percentages of each education level in the male labor force

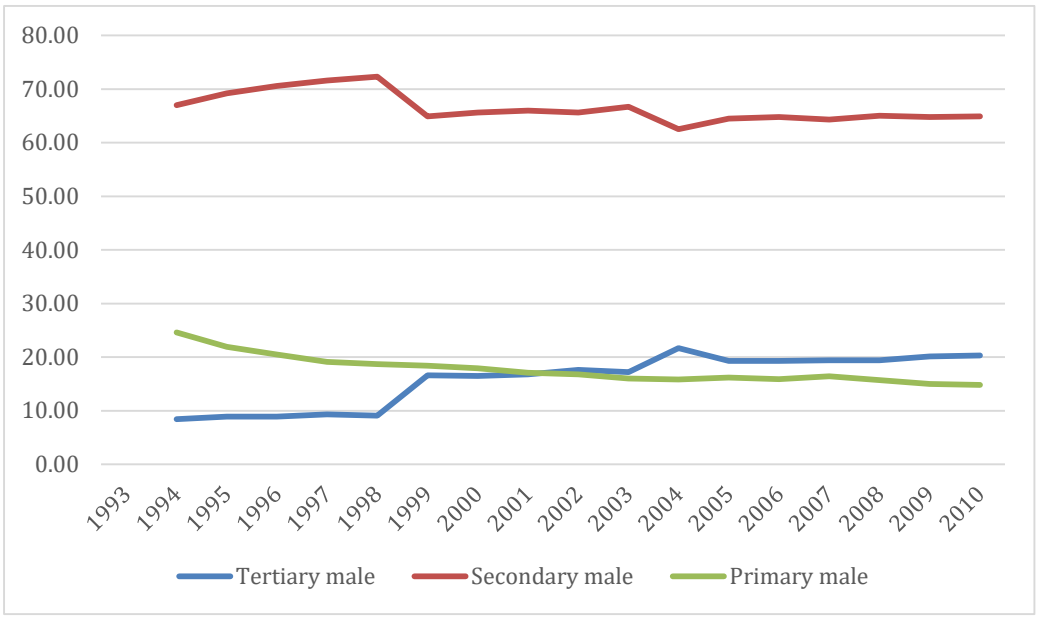

Figure A1.2 Austria: Percentages of each education level in the female labor force

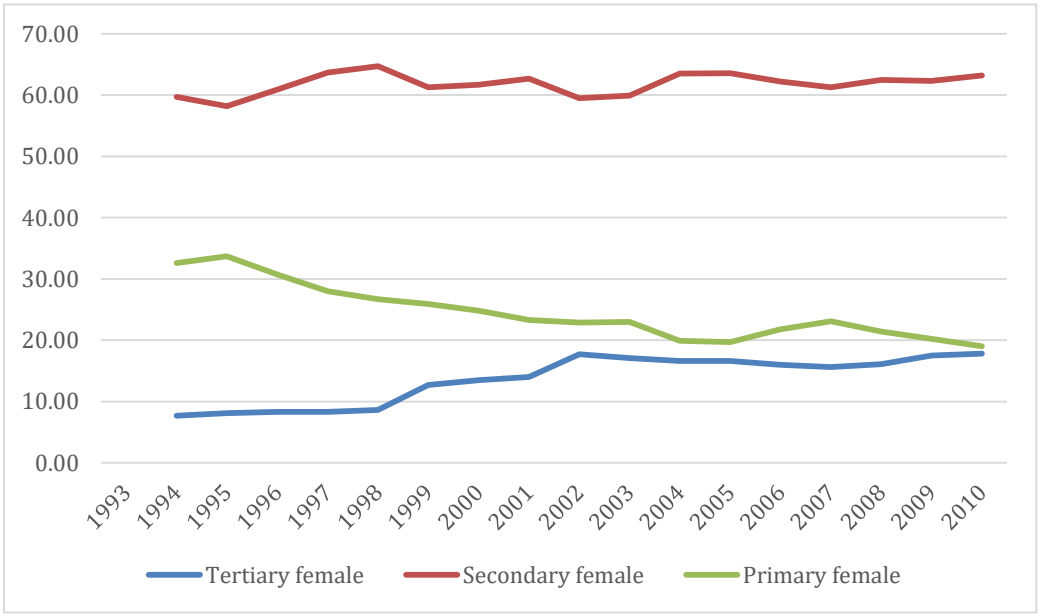

Figure A2.1 Belgium: Percentages of each education level in the male labor force

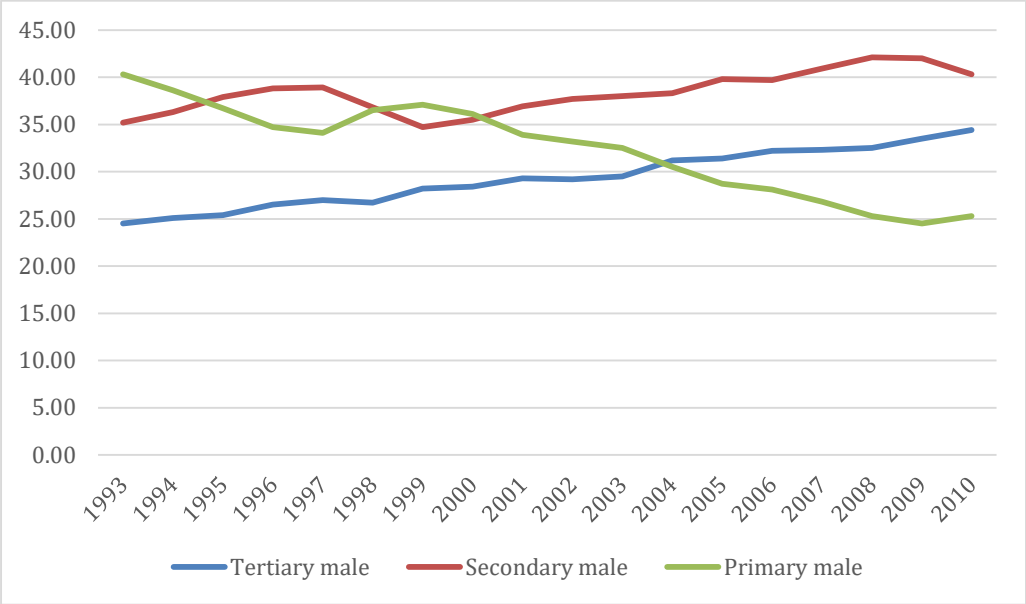

Figure A2.2 Belgium: Percentages of each education level in the female labor force

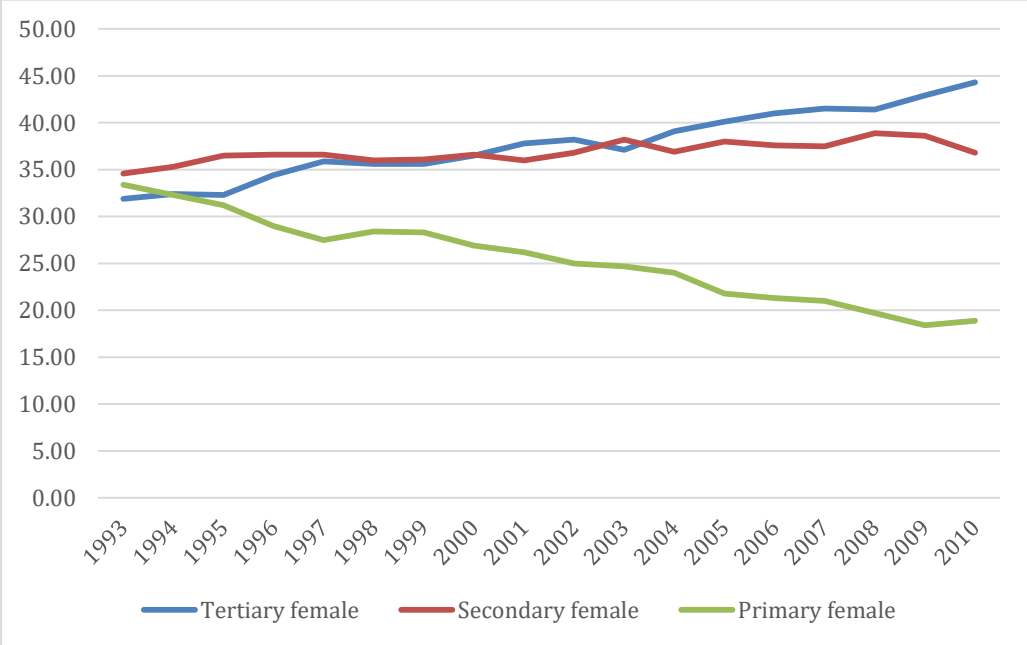

Figure A3.1 Finland: Percentages of each education level in the male labor force

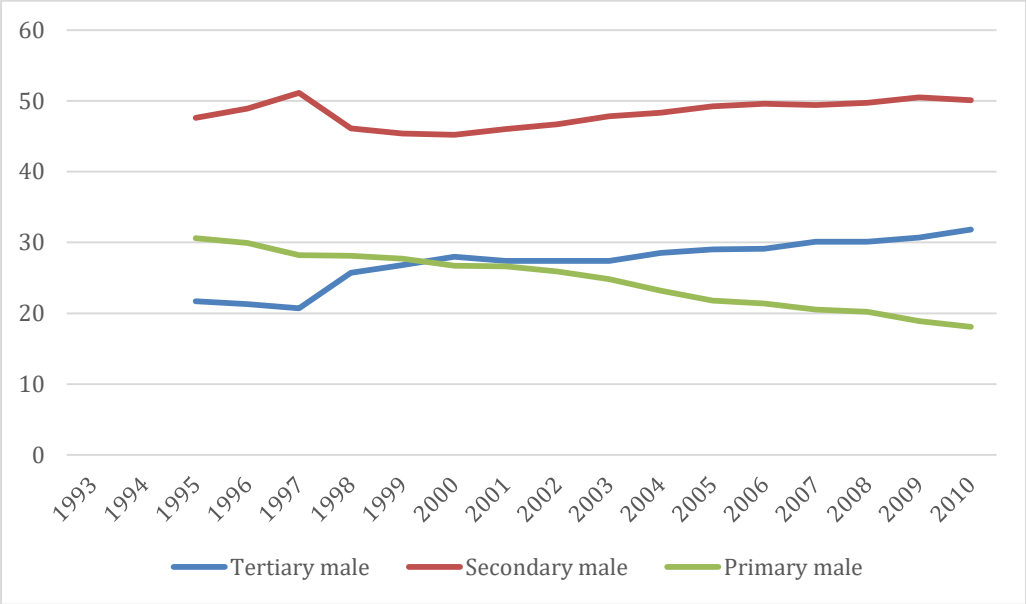

Figure A3.2 Belgium: Percentages of each education level in the female labor force

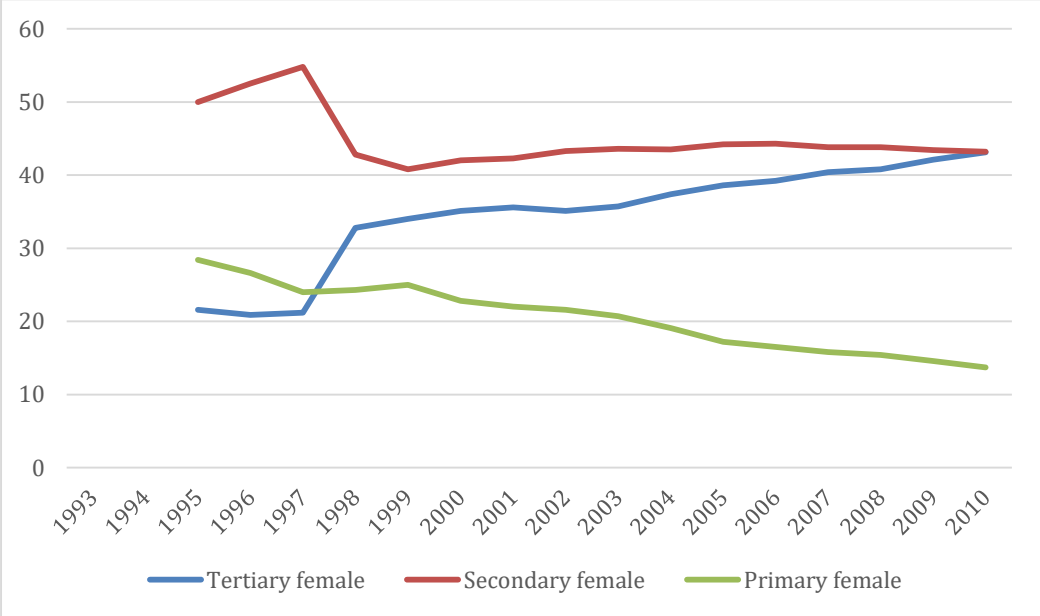

Figure A4.1 France: Percentages of each education level in the male labor force

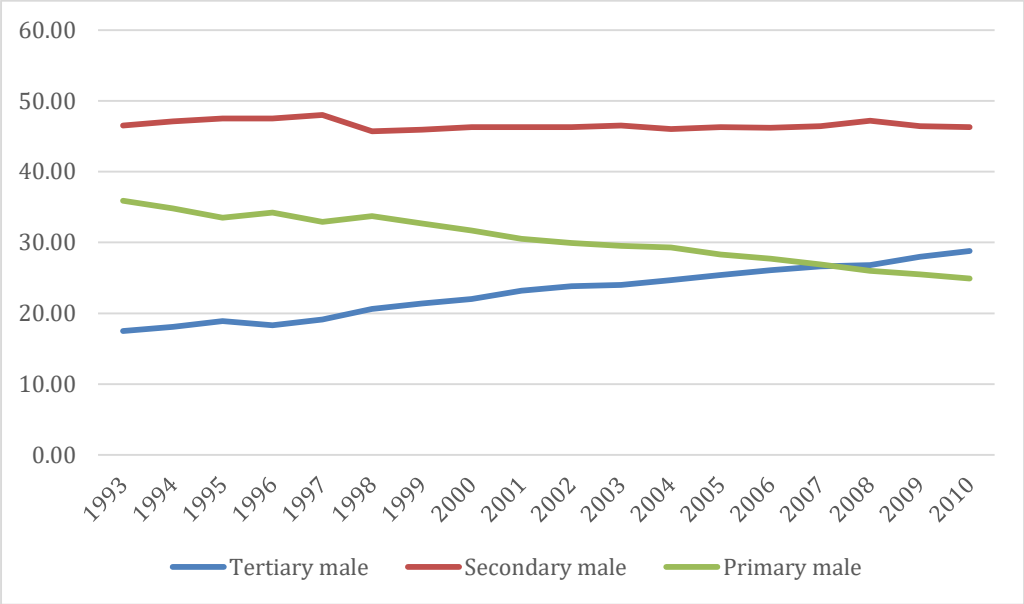

Figure A4.2 France: Percentages of each education level in the female labor force

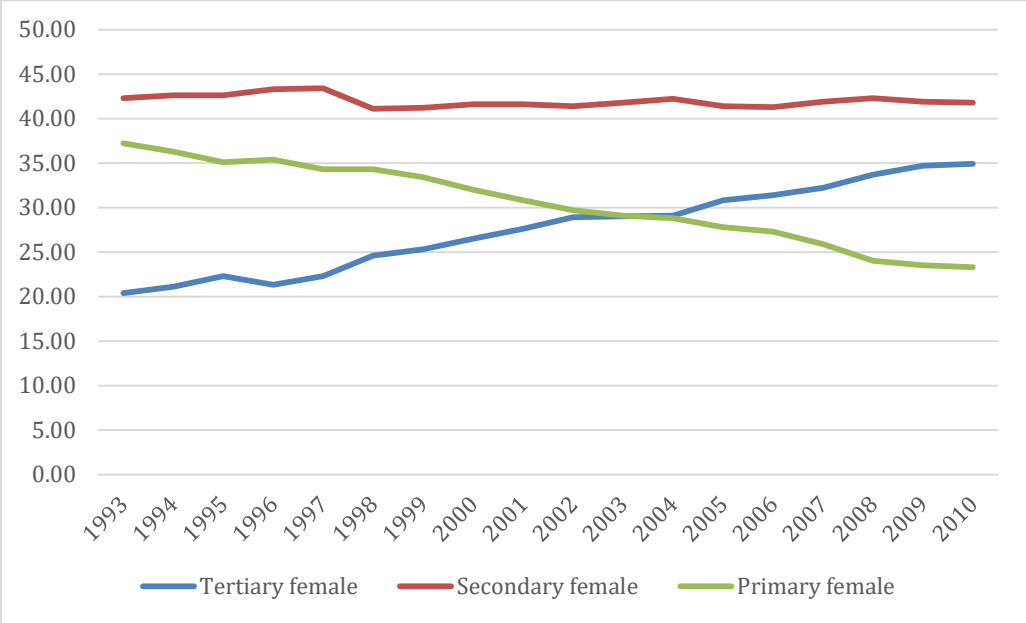

Figure A5.1 Germany: Percentages of each education level in the male labor force

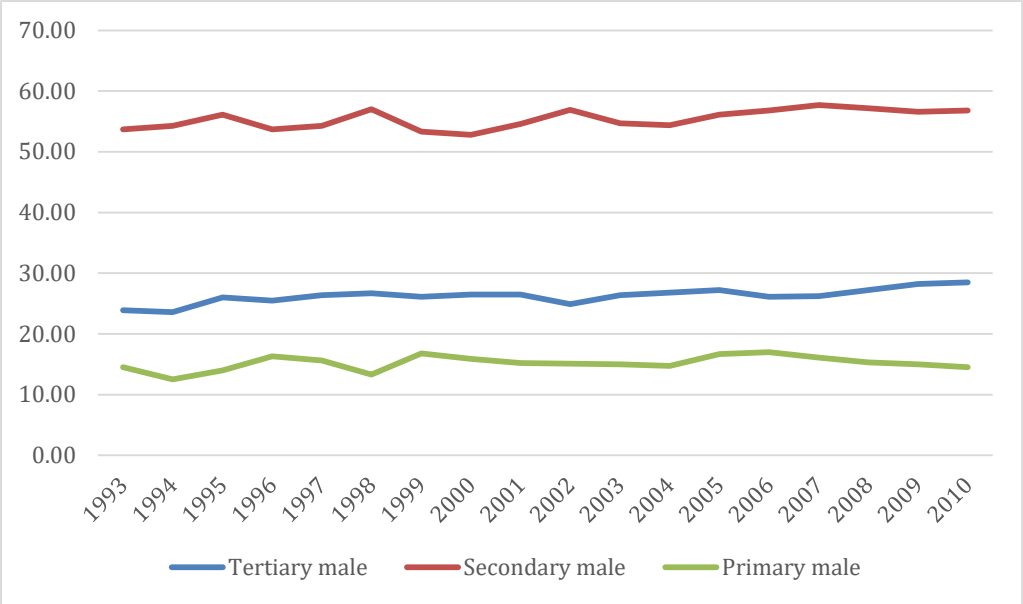

Figure A5.2 Germany: Percentages of each education level in the female labor force

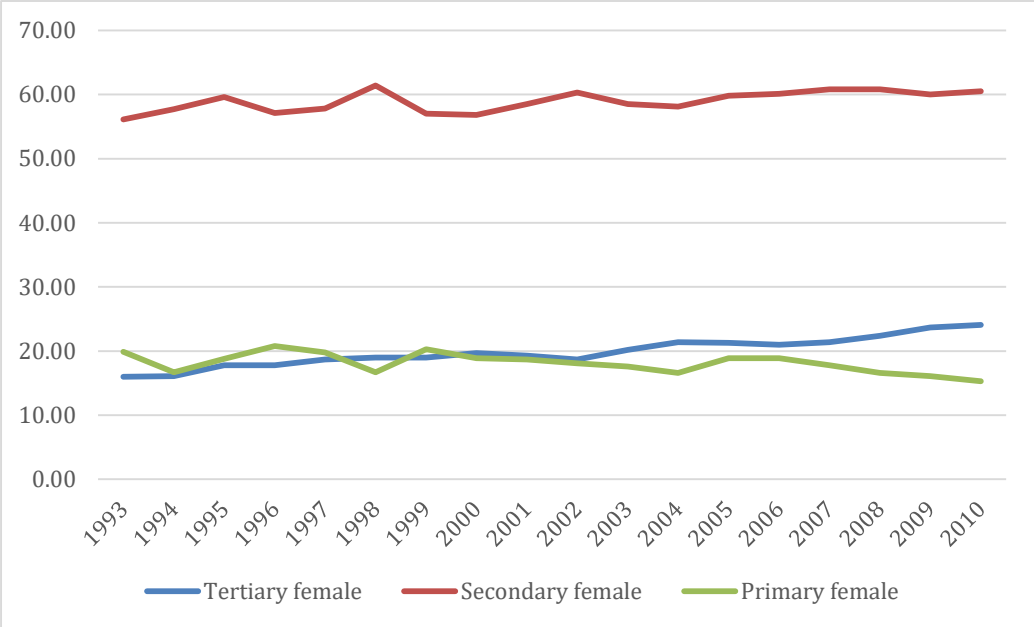

Figure A6.1 Ireland: Percentages of each education level in the male labor force

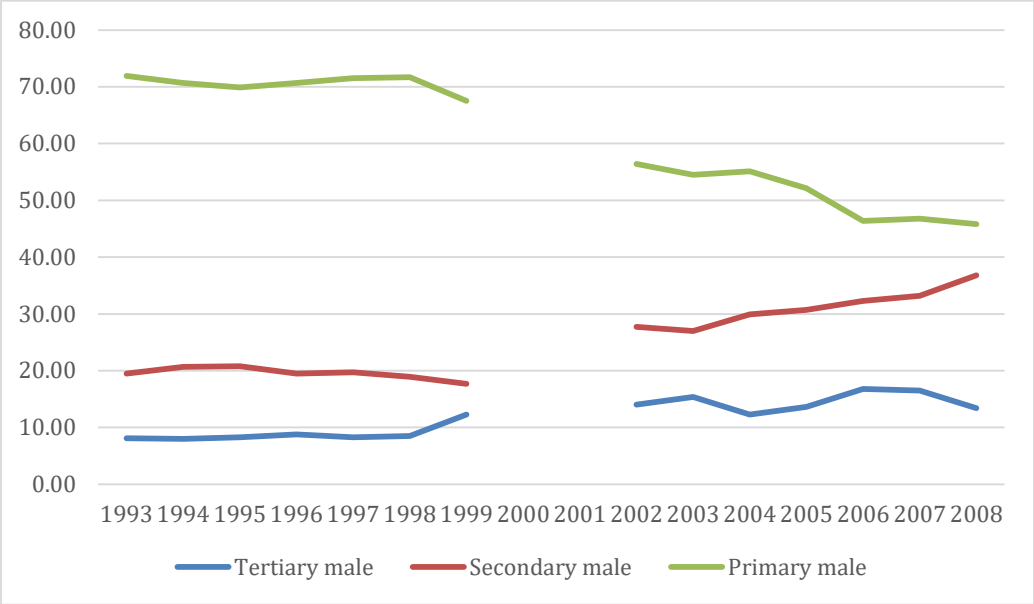

Figure A6.2 Ireland: Percentages of each education level in the female labor force

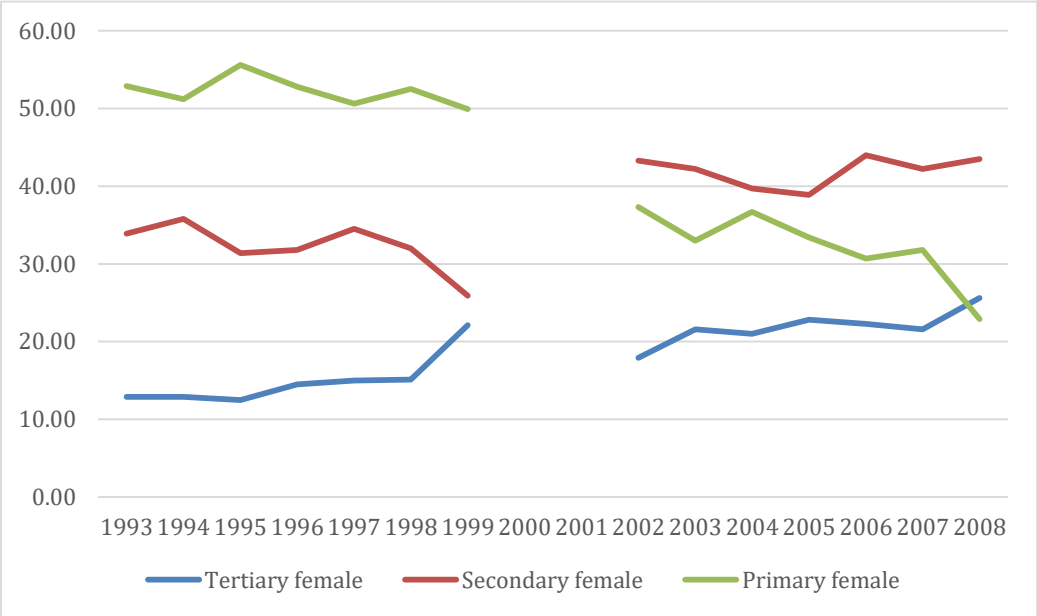

Figure A7.1 Italy: Percentages of each education level in the male labor force

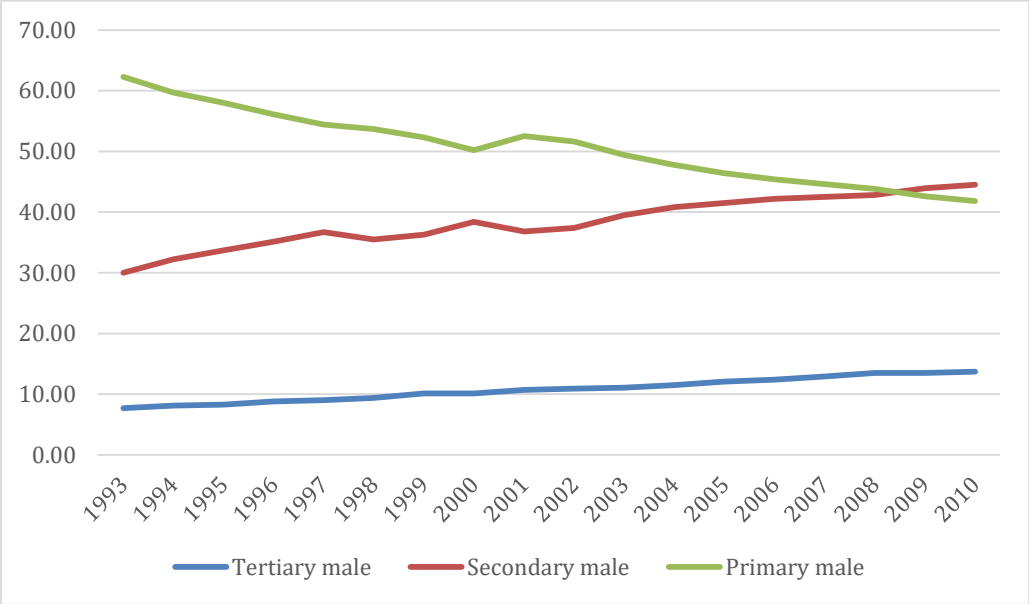

Figure A7.2 Italy: Percentages of each education level in the female labor force

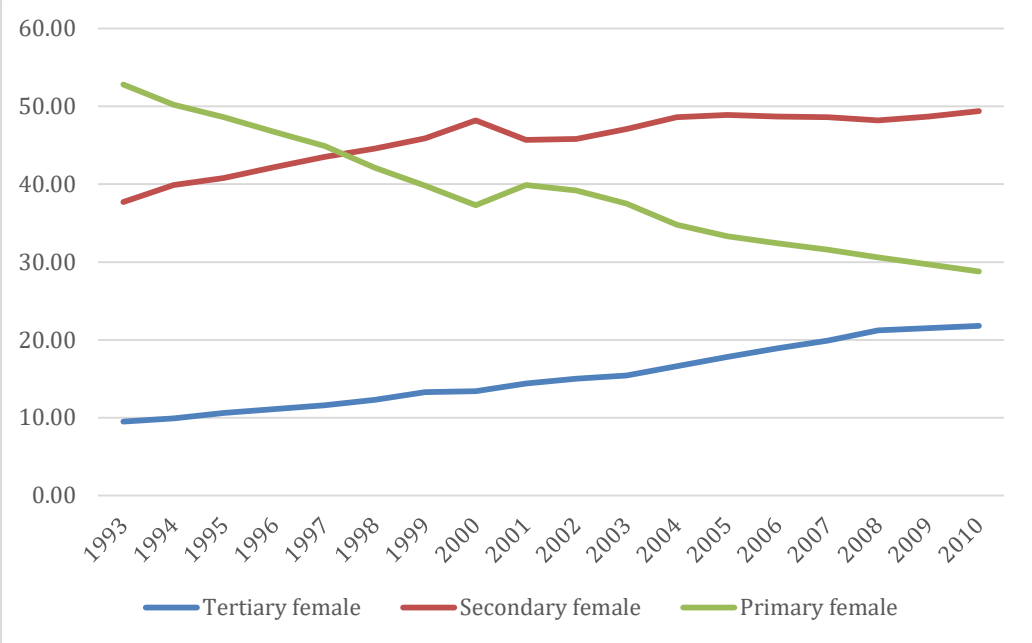

Figure A8.1 Spain: Percentages of each education level in the male labor force

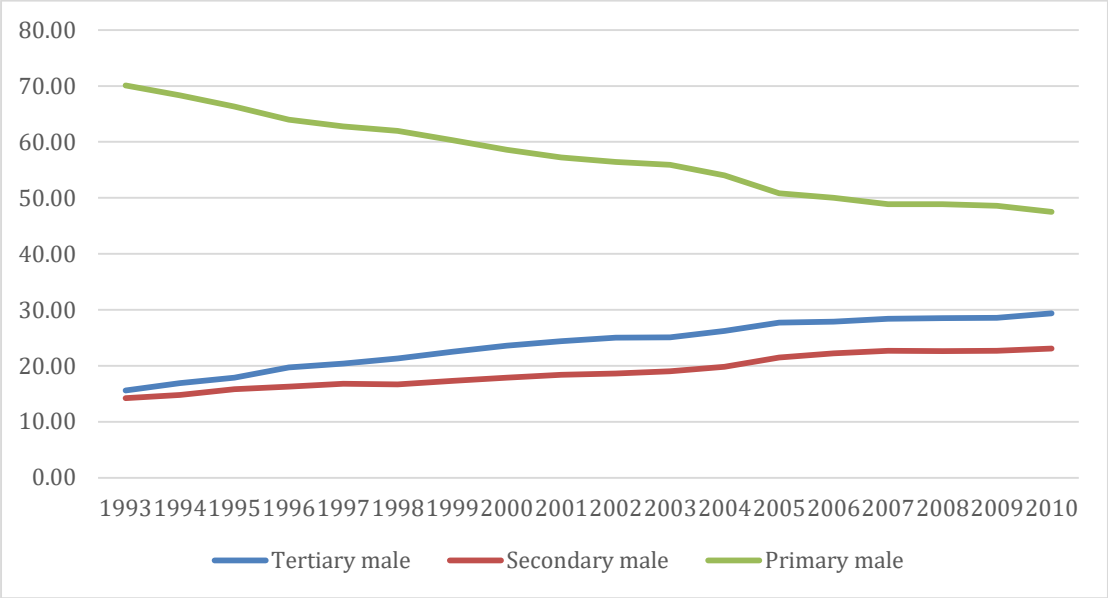

Figure A8.2 Spain: Percentages of each education level in the female labor force

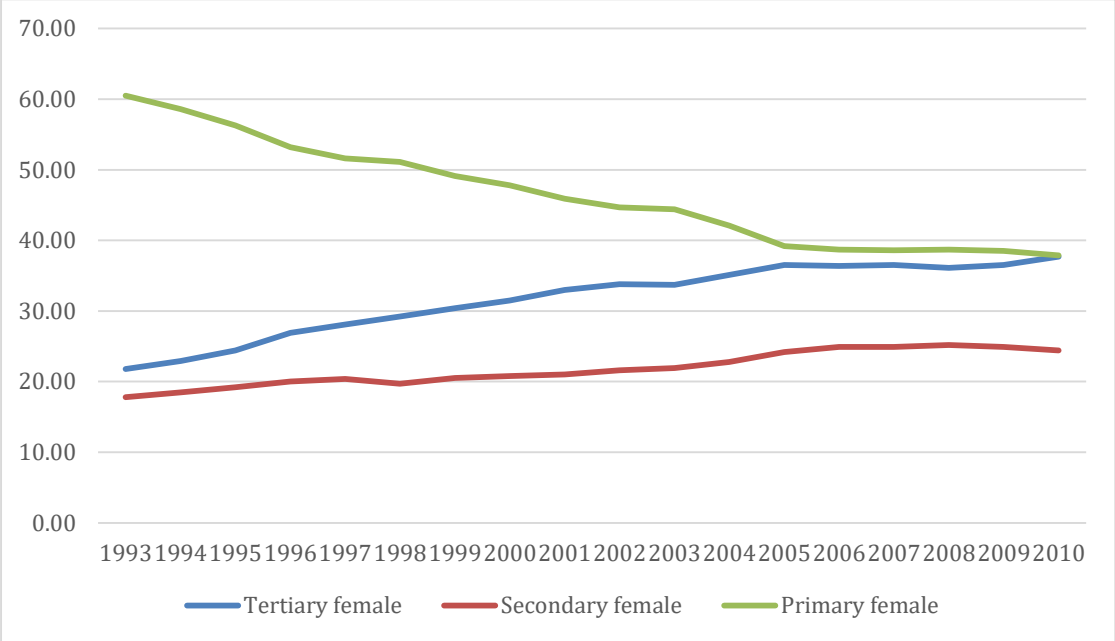

Figure A9.1 The Netherlands: Percentages of each education level in the male labor force

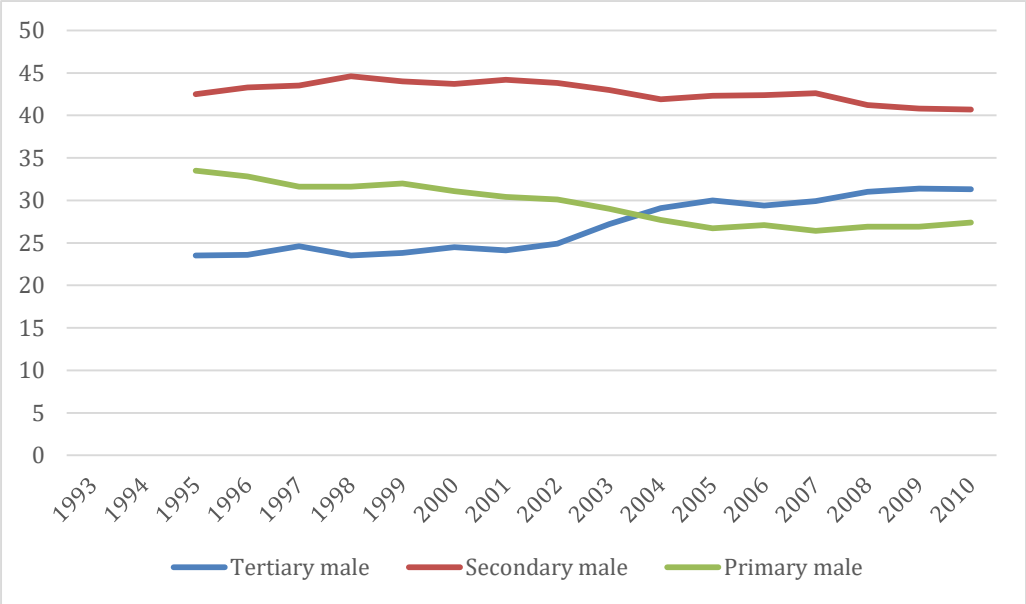

Figure A9.2 The Netherlands: Percentages of each education level in the female labor force

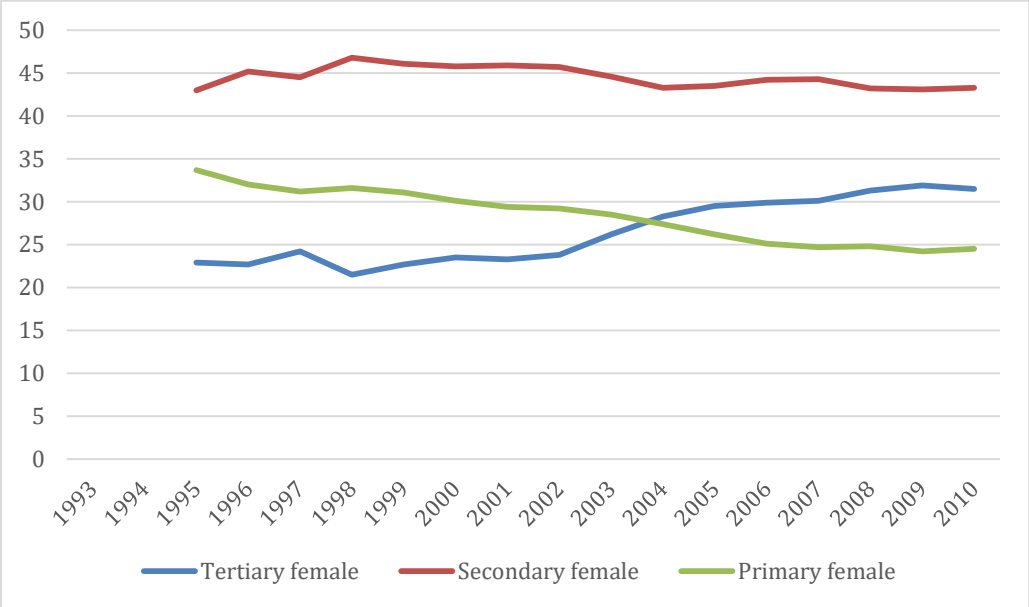

Figure A10.1 Portugal: Percentages of each education level in the male labor force

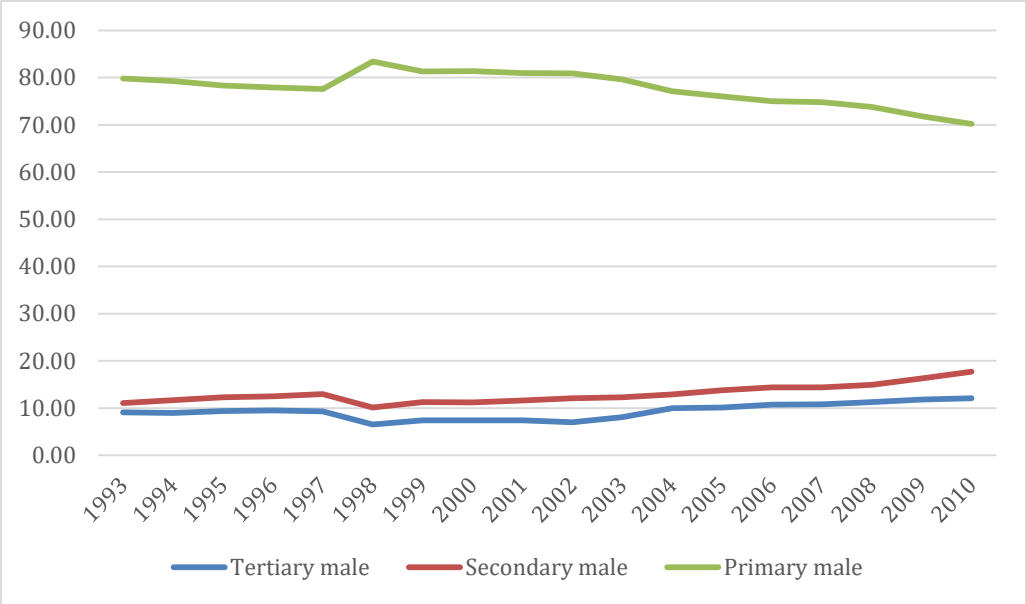

Figure A10.2 Portugal: Percentages of each education level in the female labor force

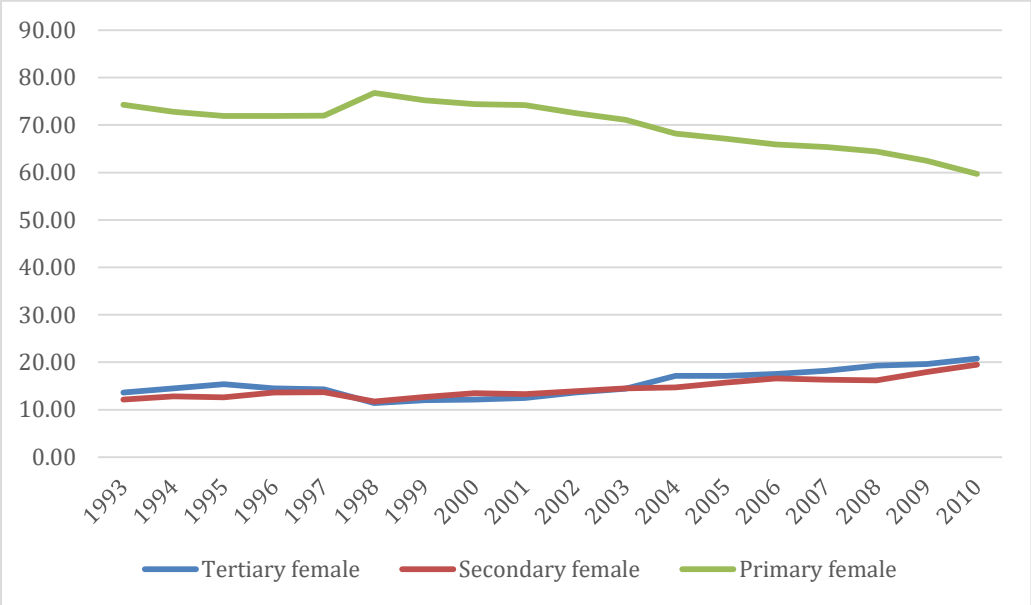

Figure A11.1 Norway: Percentages of each education level in the male labor force

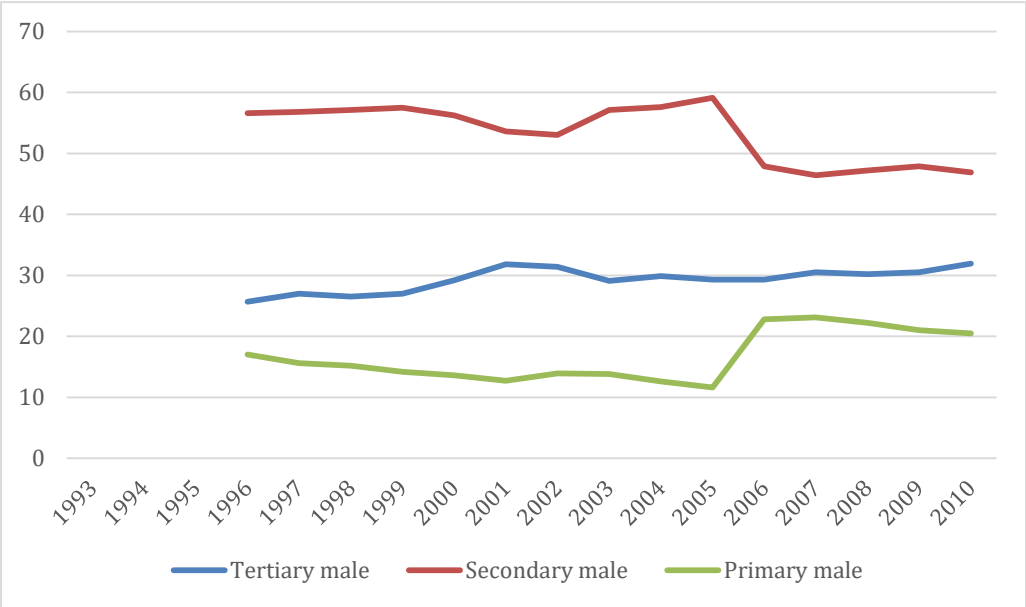

Figure A11.2 Norway: Percentages of each education level in the female labor force

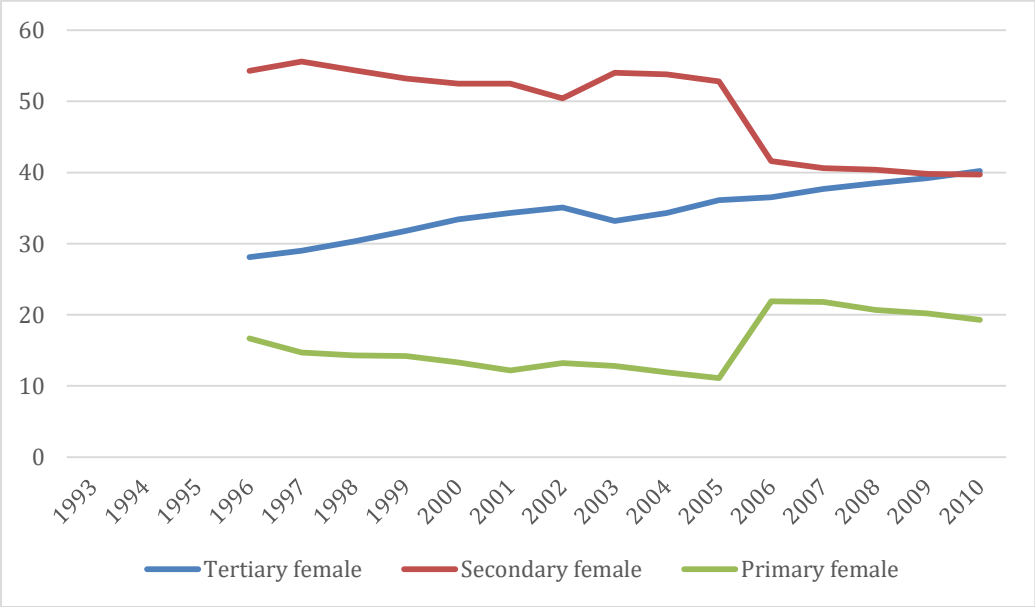

Figure A12.1 Sweden: Percentages of each education level in the male labor force

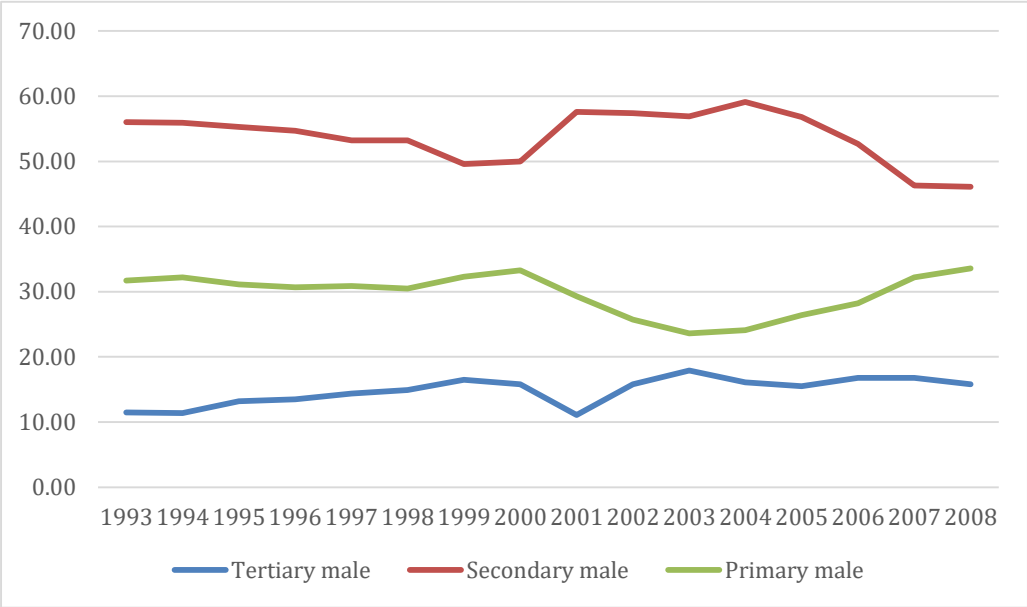

Figure A12.2 Sweden: Percentages of each education level in the female labor force

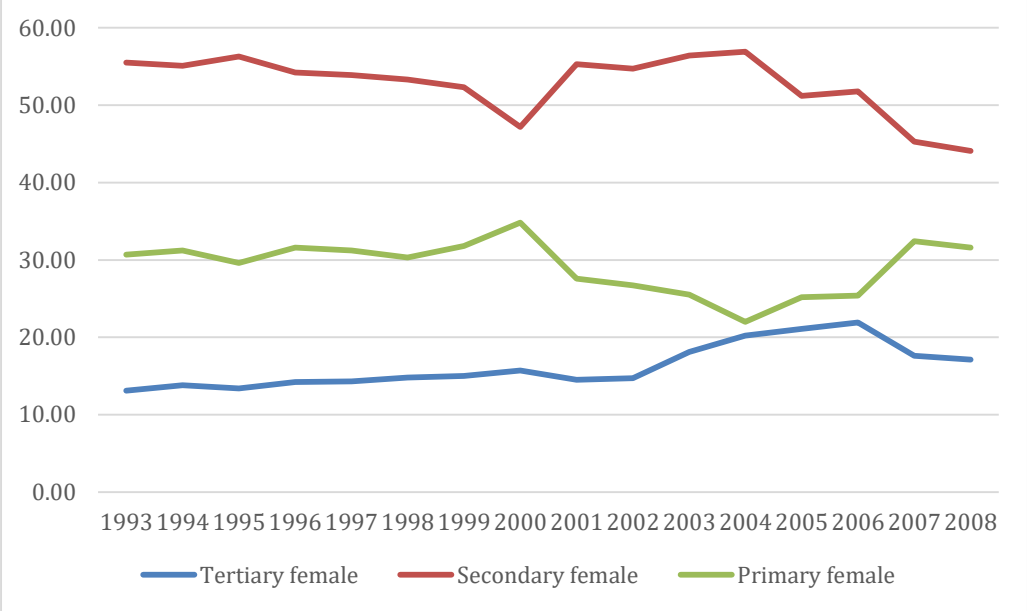

Figure A13.1 The UK: Percentages of each education level in the male labor force

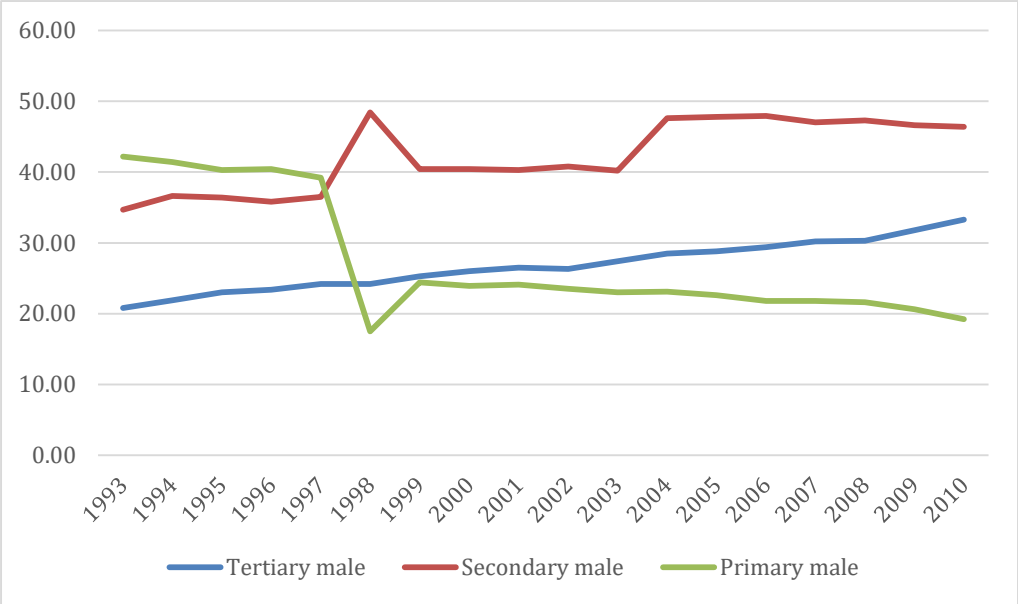

Figure A13.2 The UK: Percentages of each education level in the female labor force

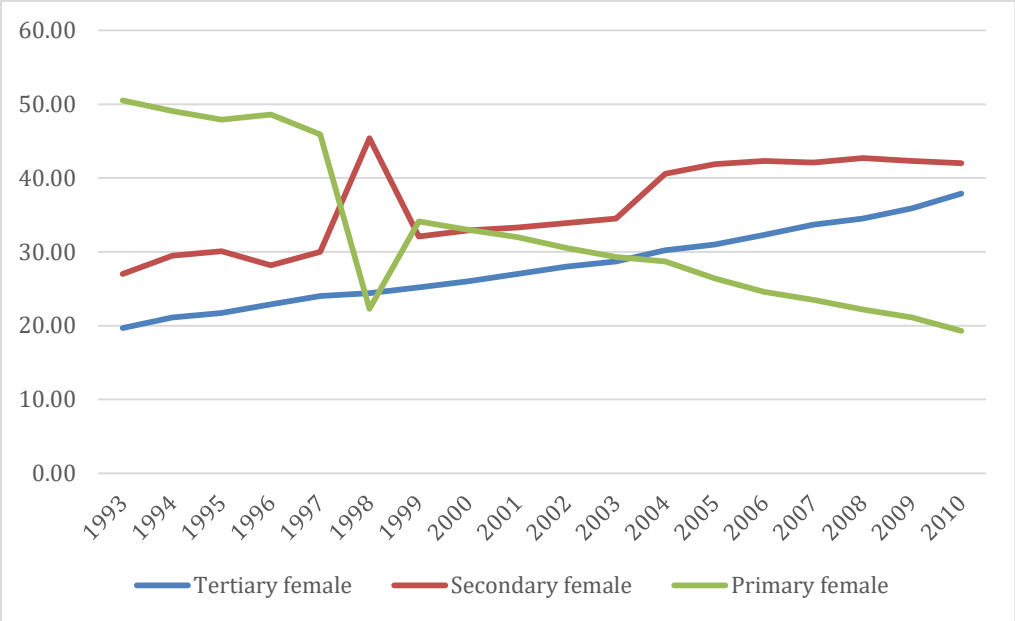

Figure B1.1 to Figure B9.2: Male and female labour market transition rates by country

Figure B1.1 Austria: male transition rates

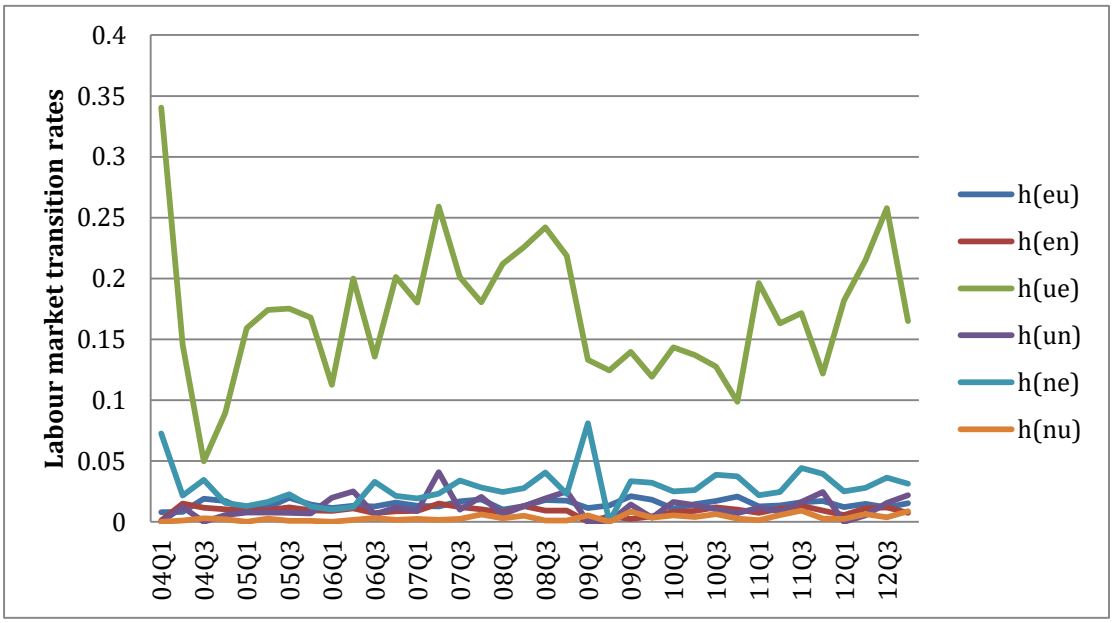

Figure B1.2 Austria: female transition rates

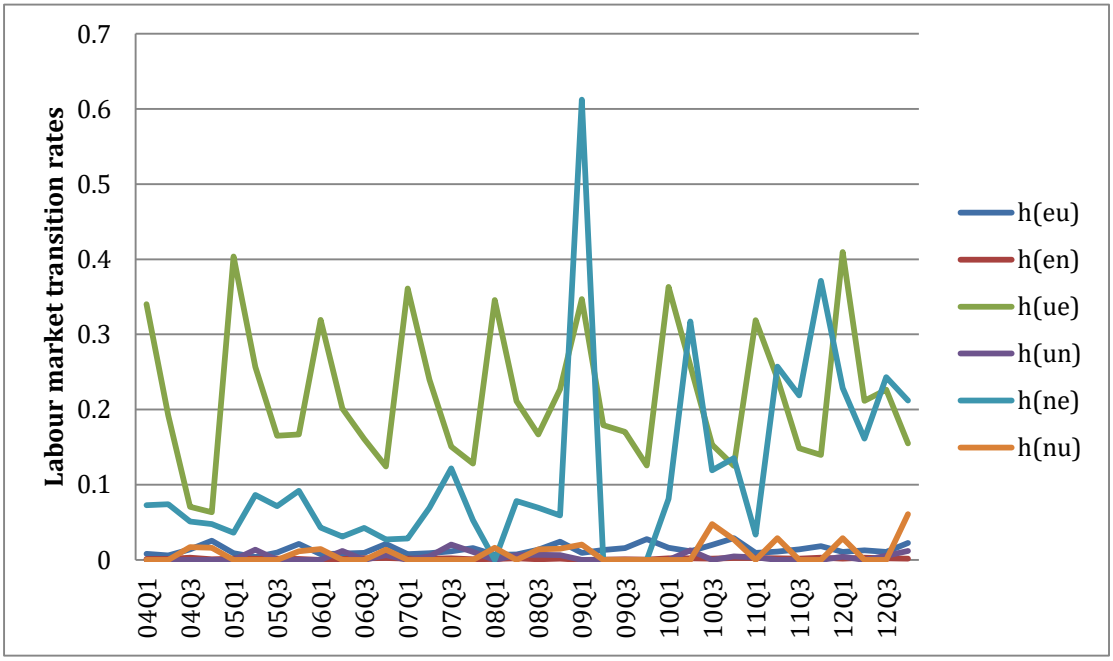

Figure B2.1 Belgium: male transition rates

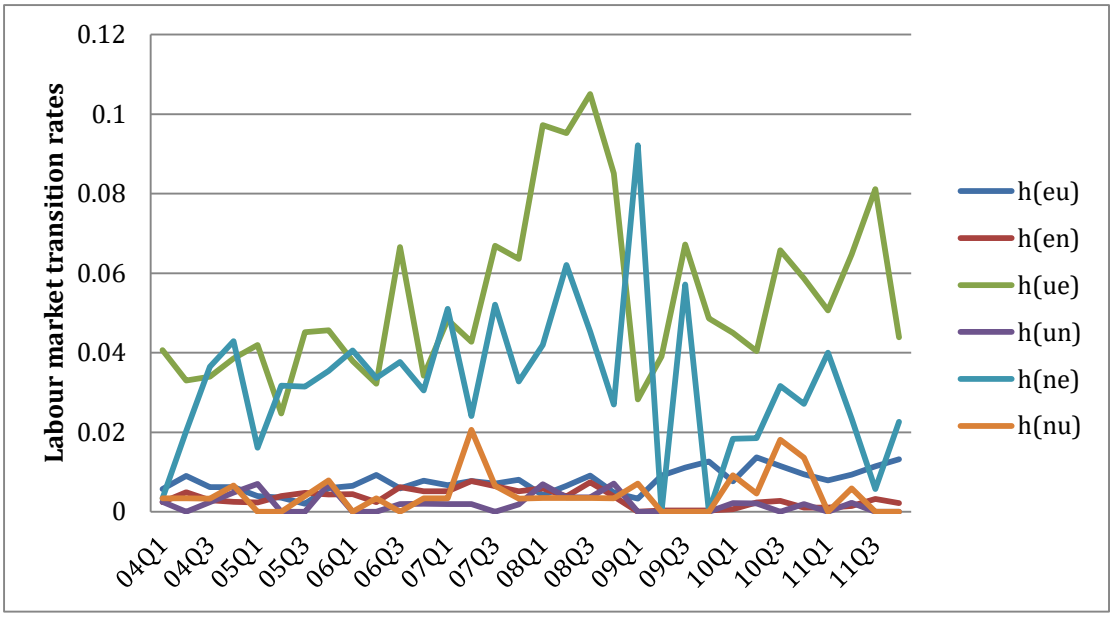

Figure B2.2 Belgium: female transition rates

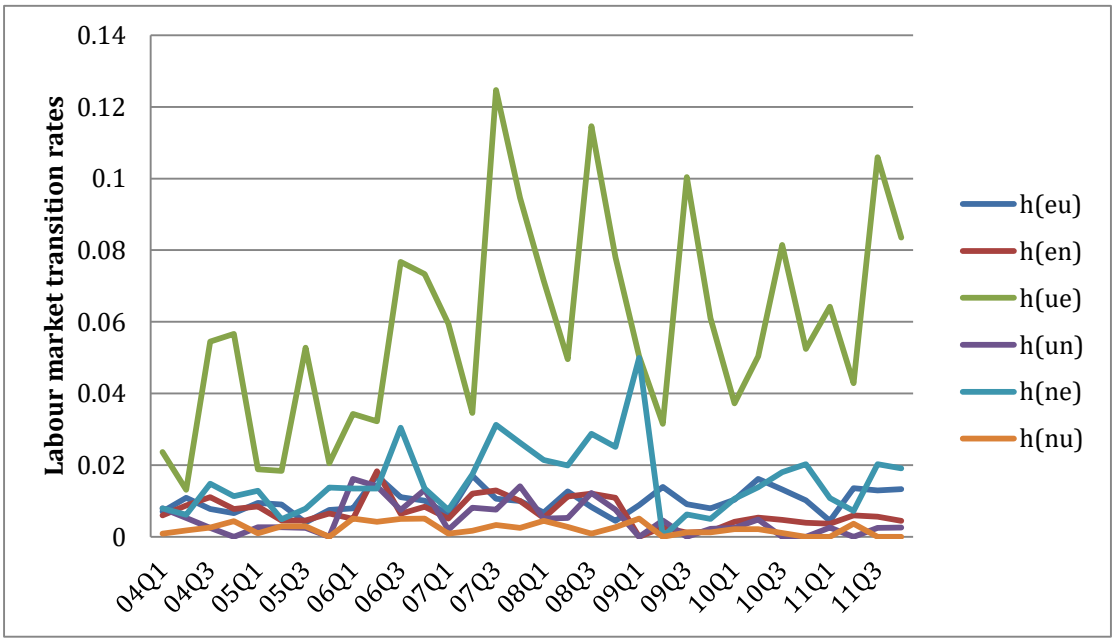

Figure B3.1 France: male transition rates

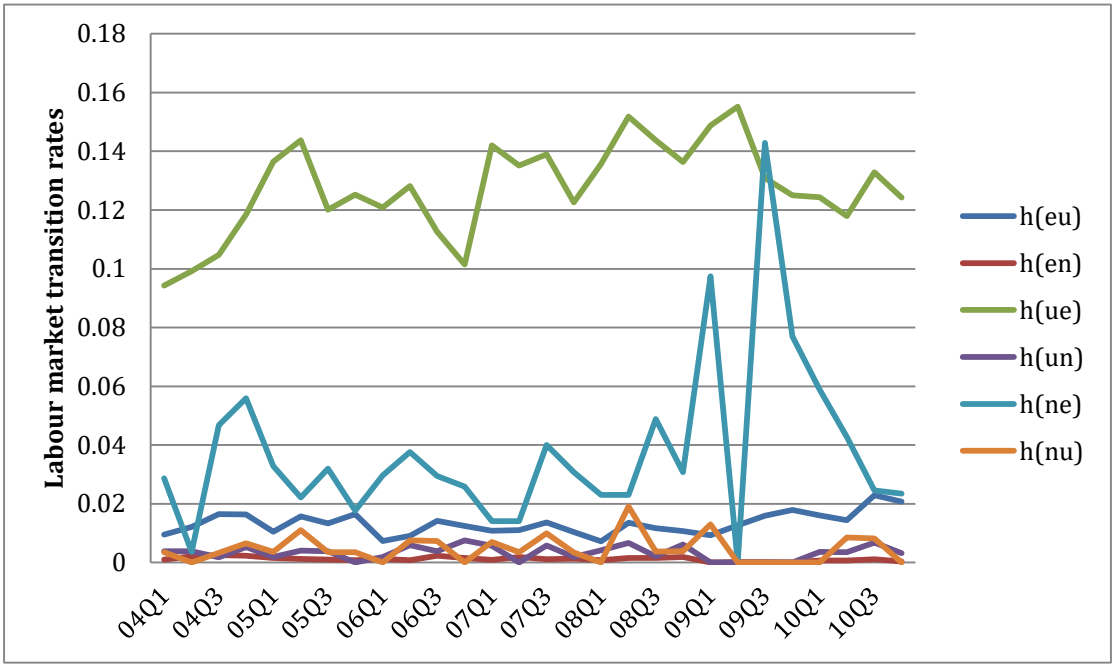

Figure B3.2 France: female transition rates

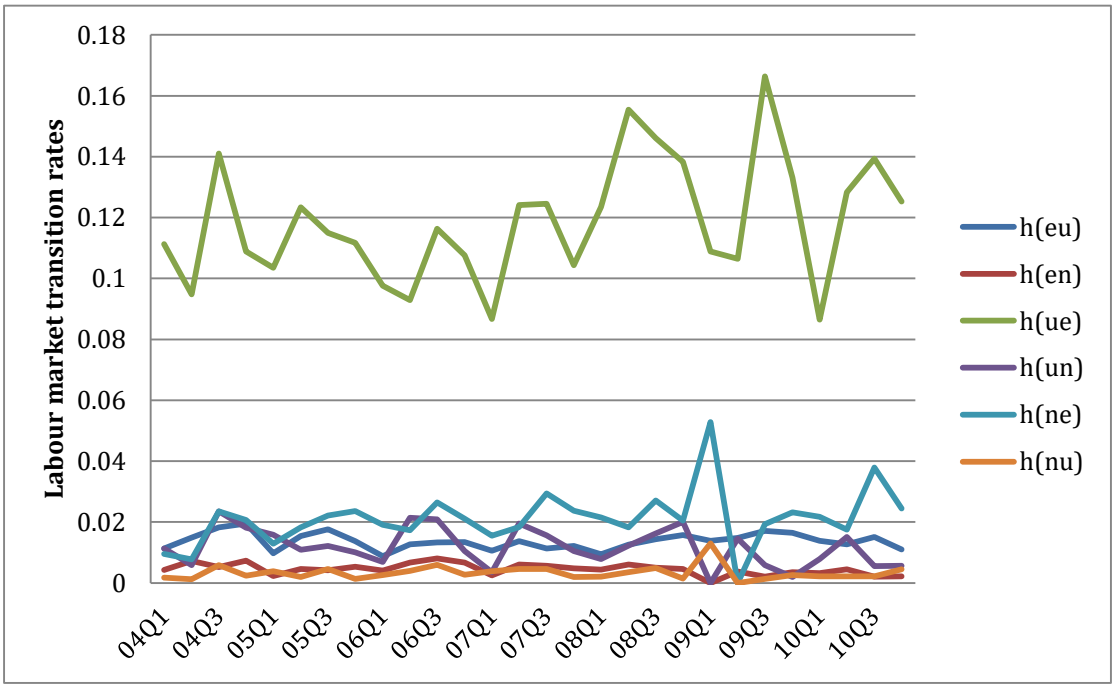

Figure B4.1 Germany: male transition rates

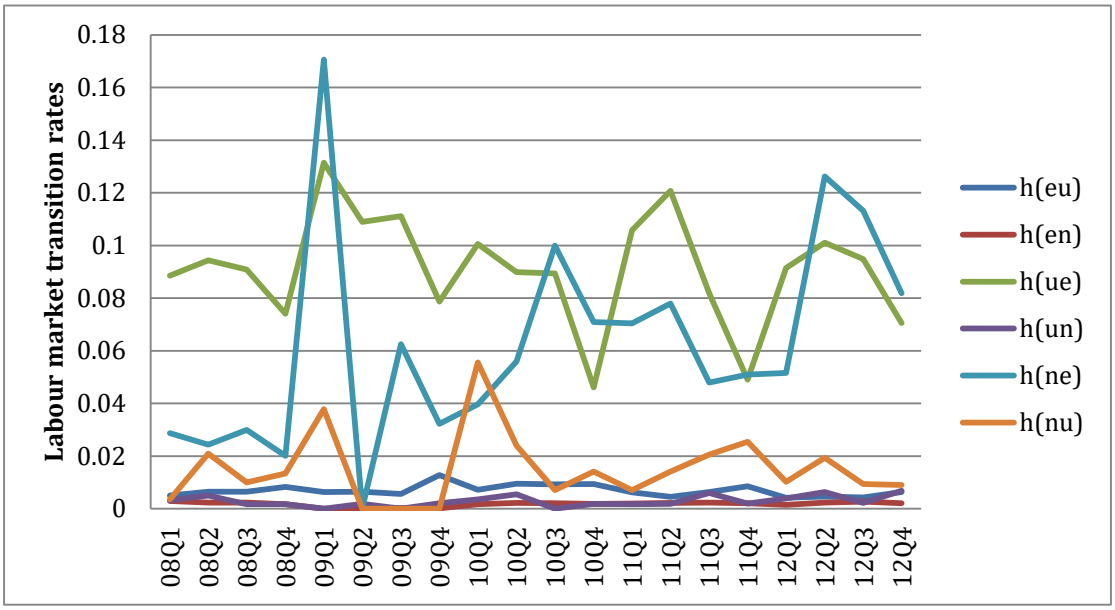

Figure B4.2 Germany: female transition rates

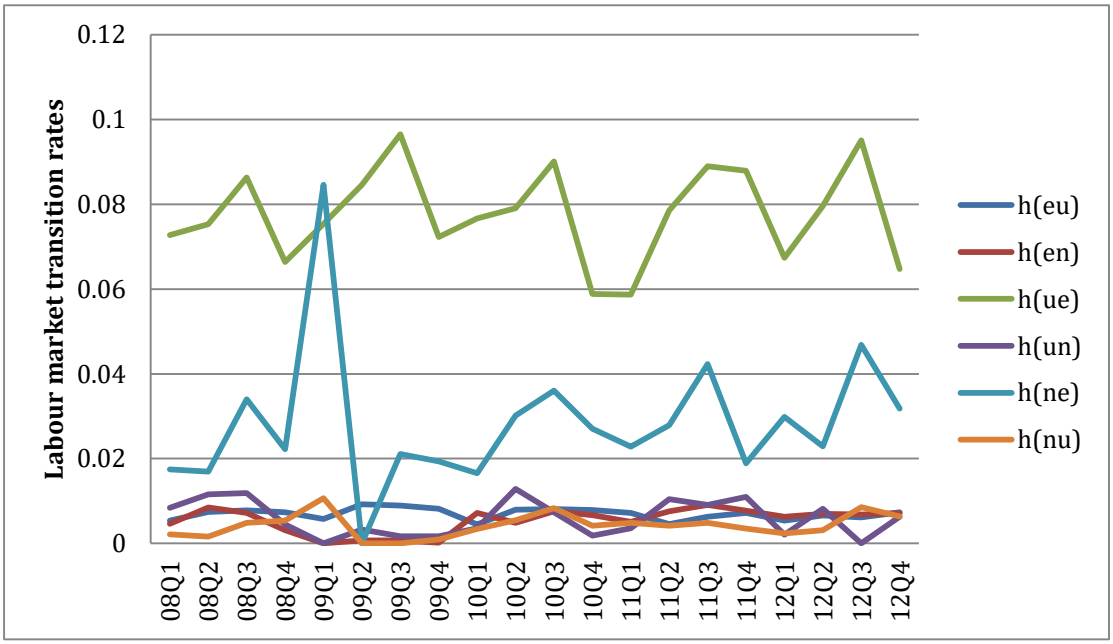

Figure B5.1 Italy: male transition rates

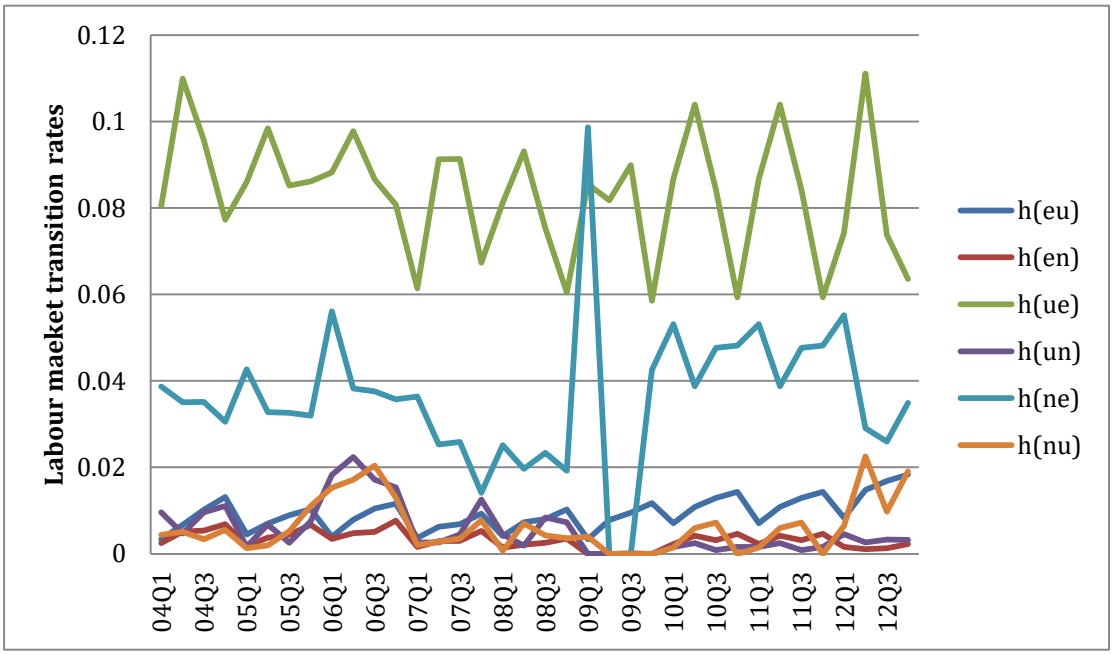

Figure B5.1 Italy: female transition rates

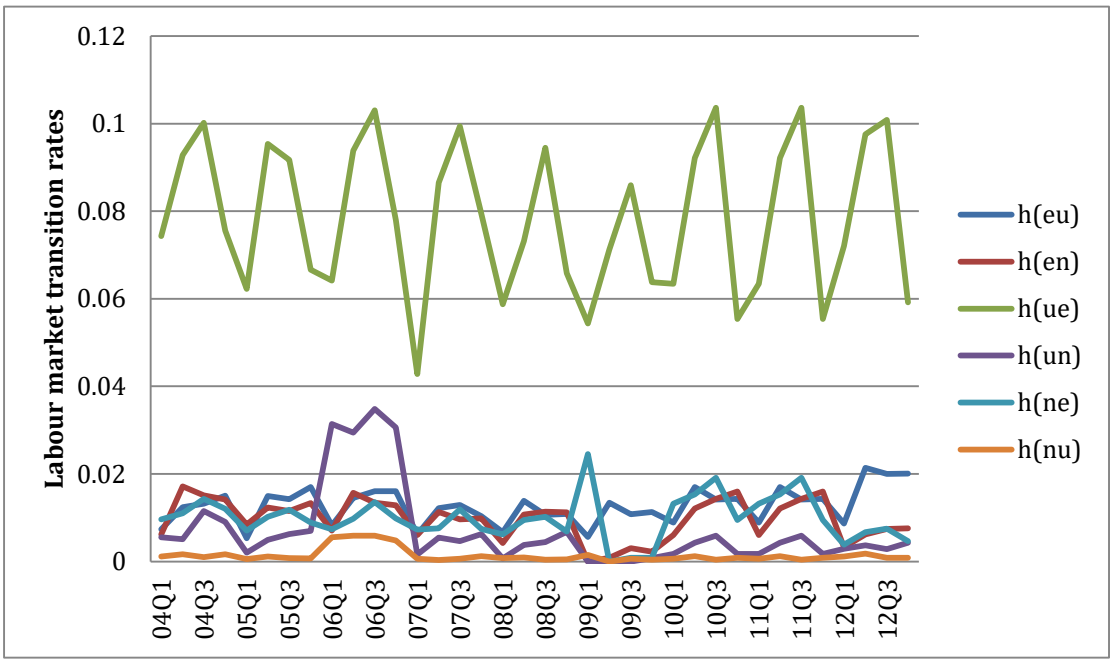

Figure B6.1 Spain: male transition rates

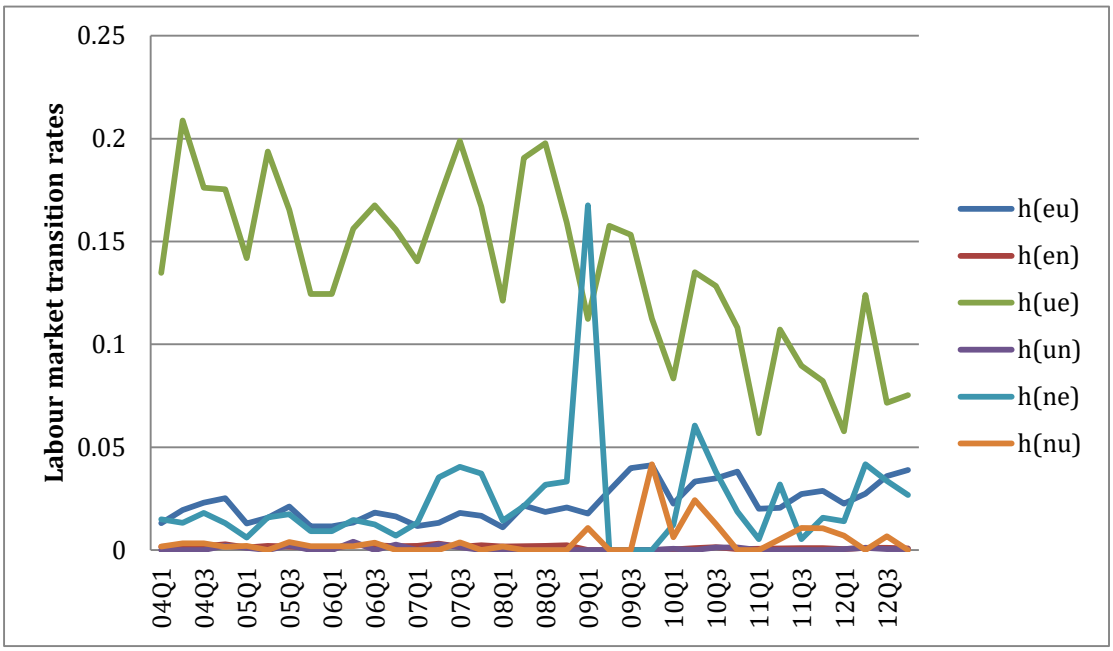

Figure B6.2 Spain: female transition rates

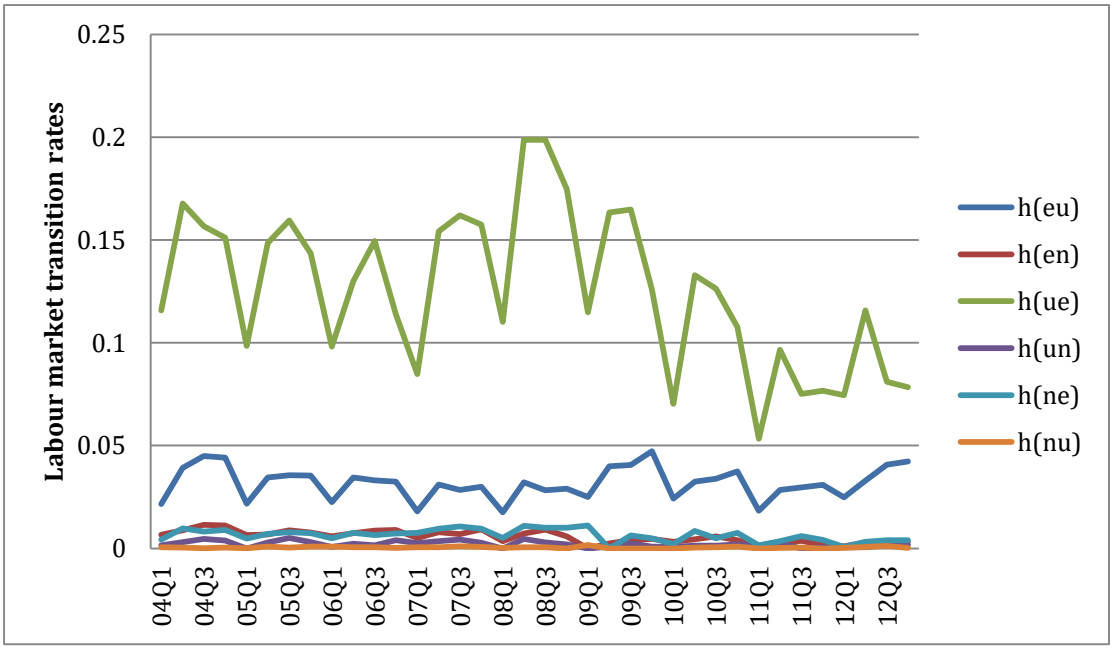

Figure B7.1 The Netherlands: male transition rates

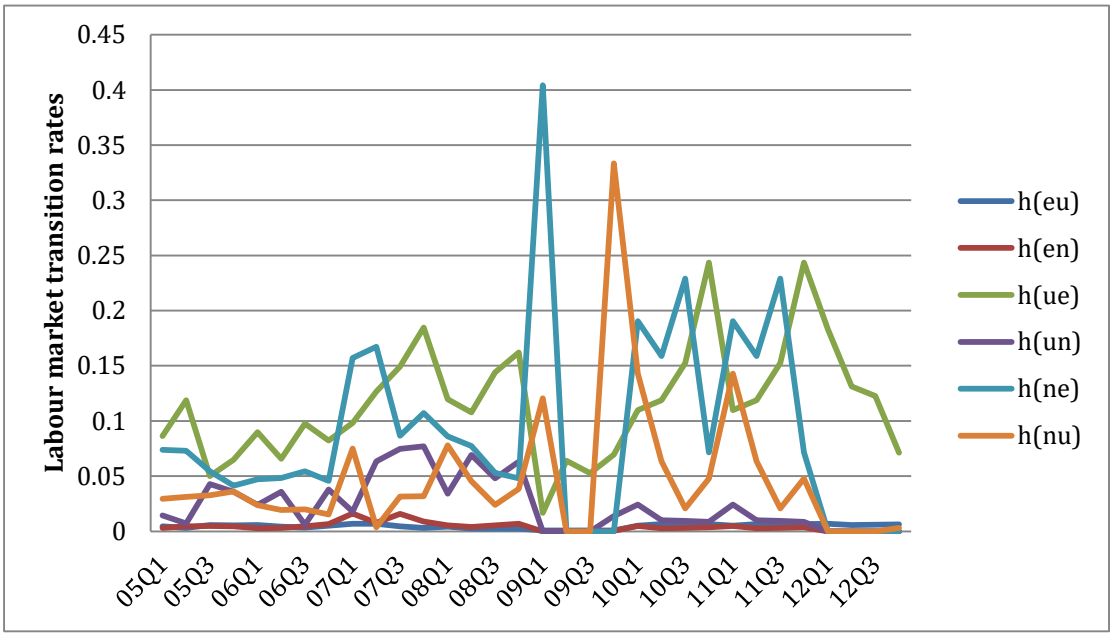

Figure B7.2 The Netherlands: female transition rates

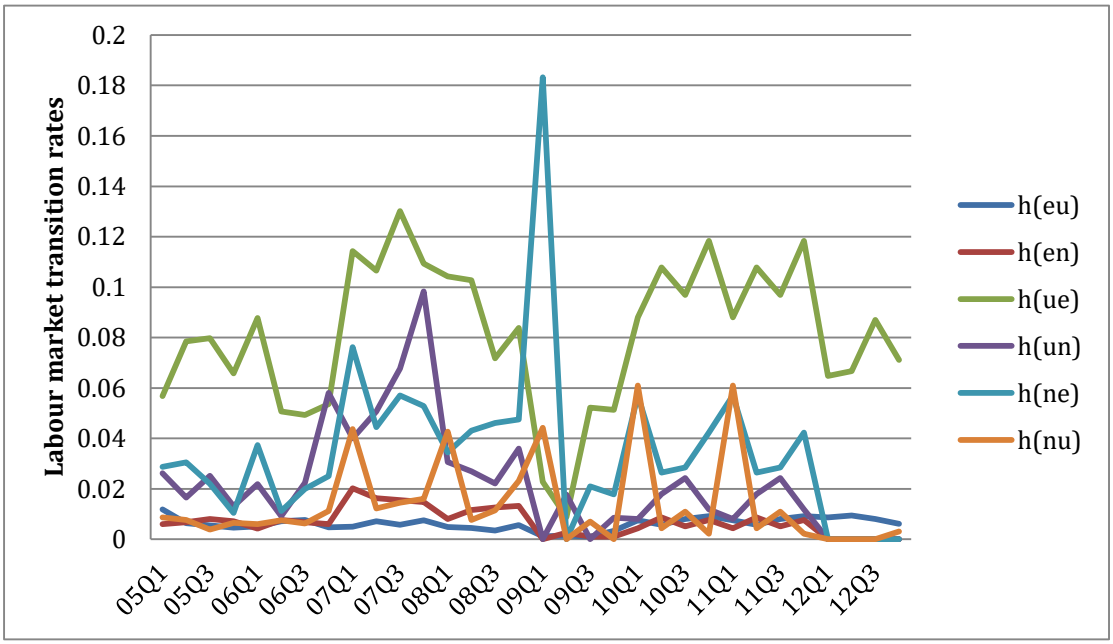

Figure B8.1 Portugal: male transition rates

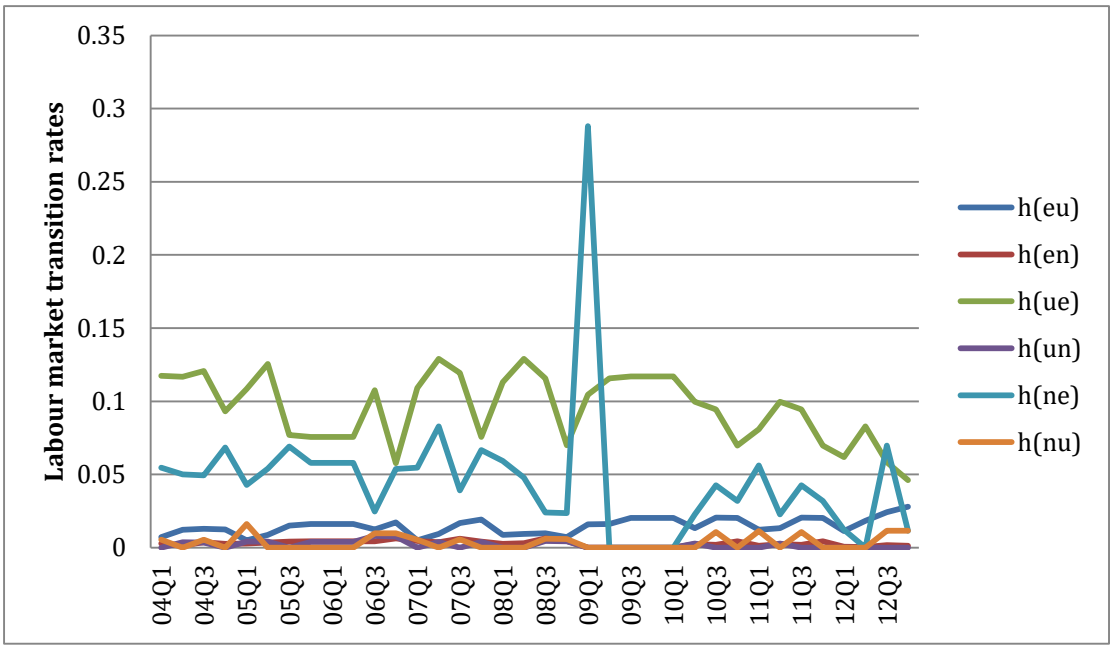

Figure B8.2 Portugal: female transition rates

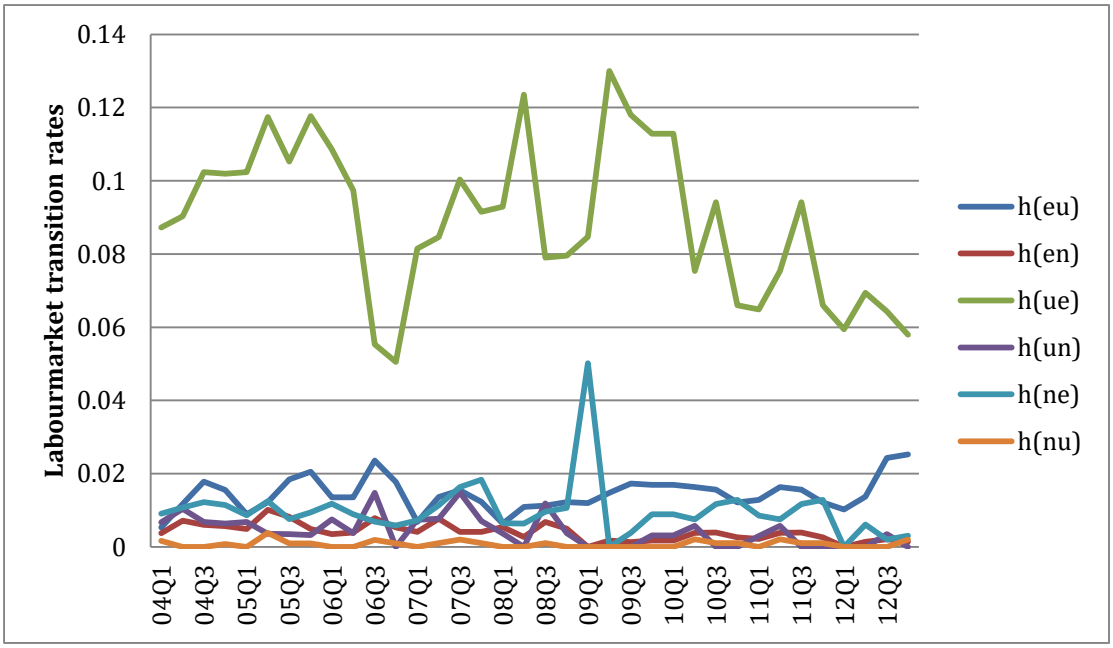

Figure B9.1 The UK: male transition rates

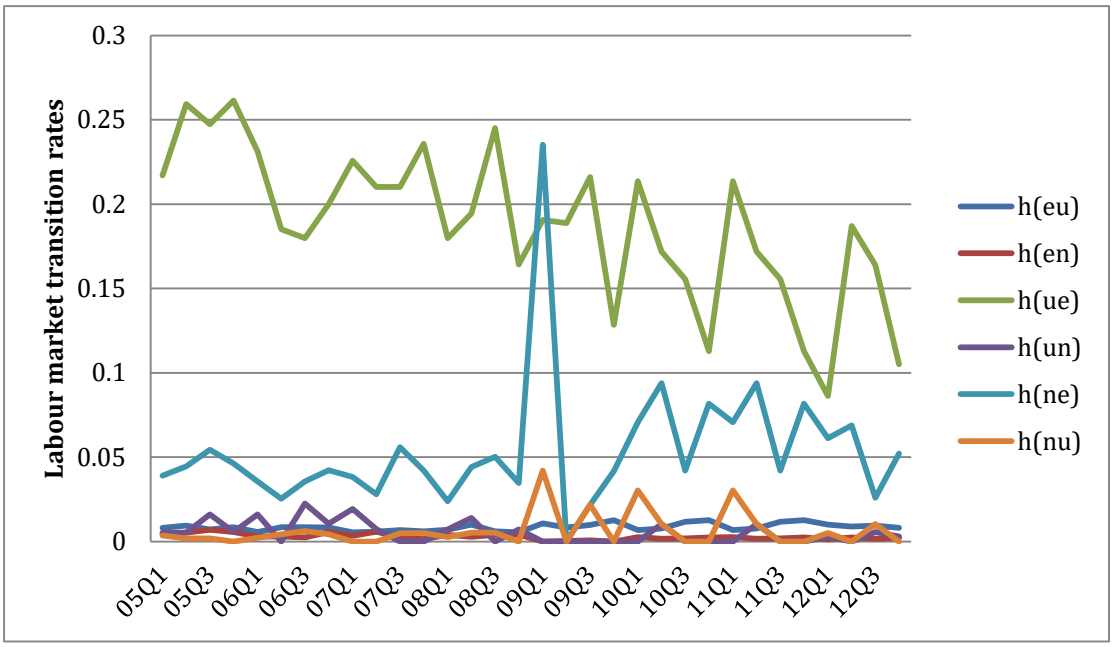

Figure B9.2 The UK: female transition rates